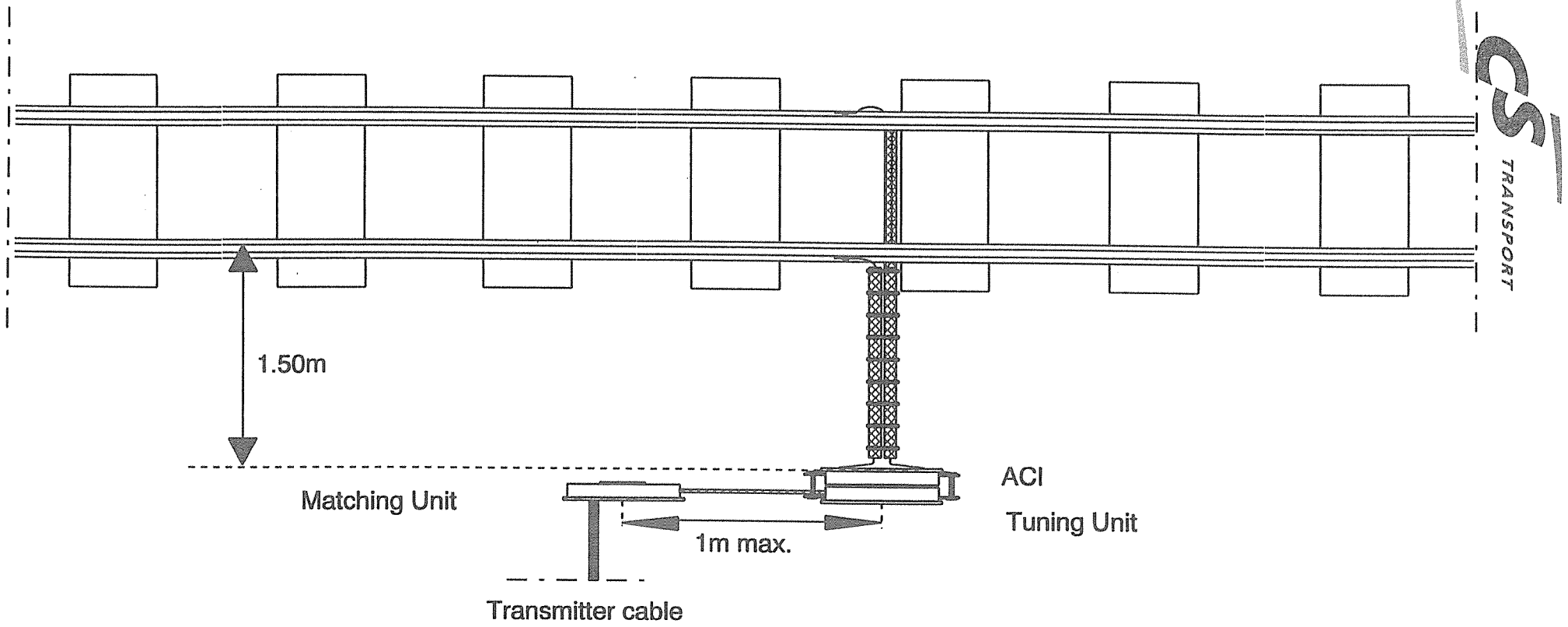
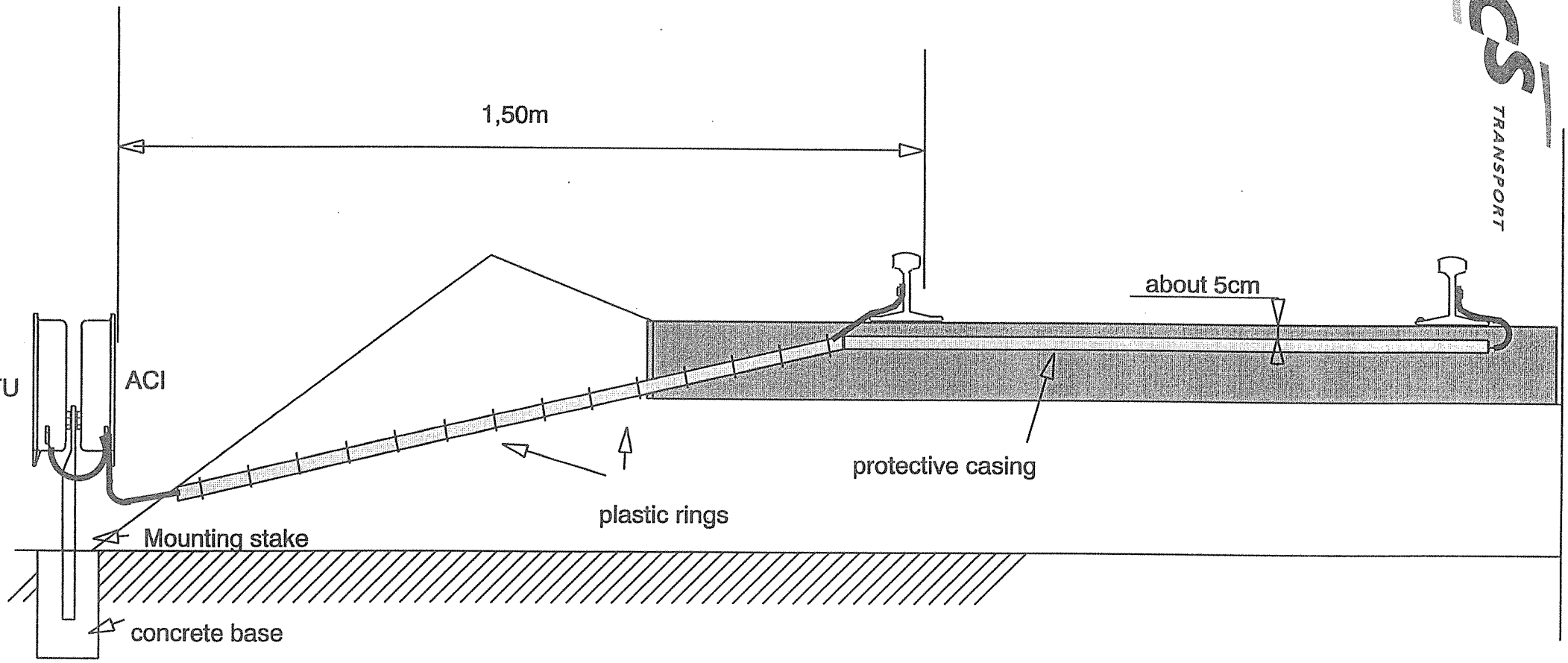
APPENDIX 23



INTERMEDIATE TRANSMISSION - IT

Configuration

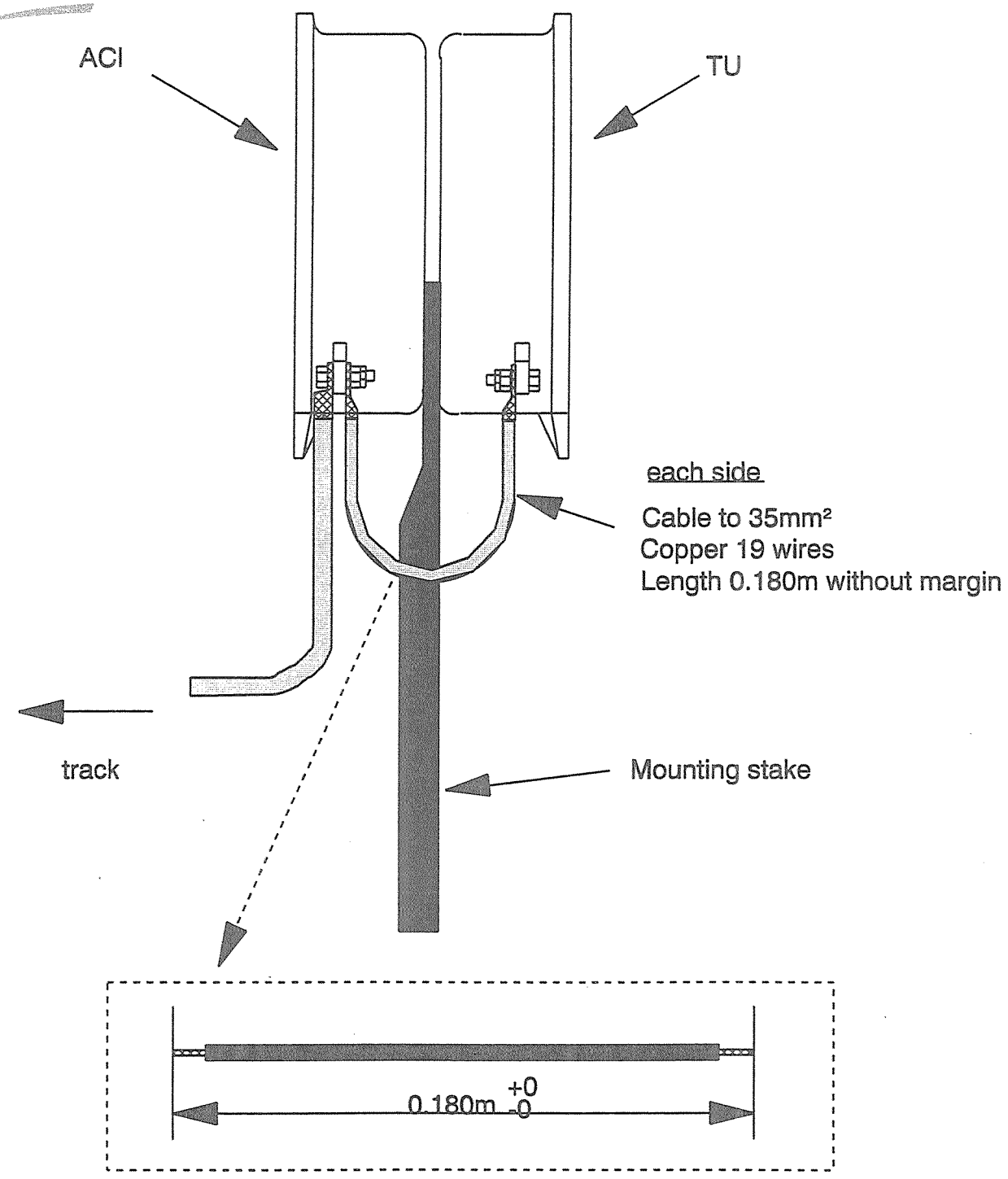
A016



INTERMEDIATE TRANSMISSION - IT
ERECTING PLAN Air Core Inductor / Tuning Unit

A055

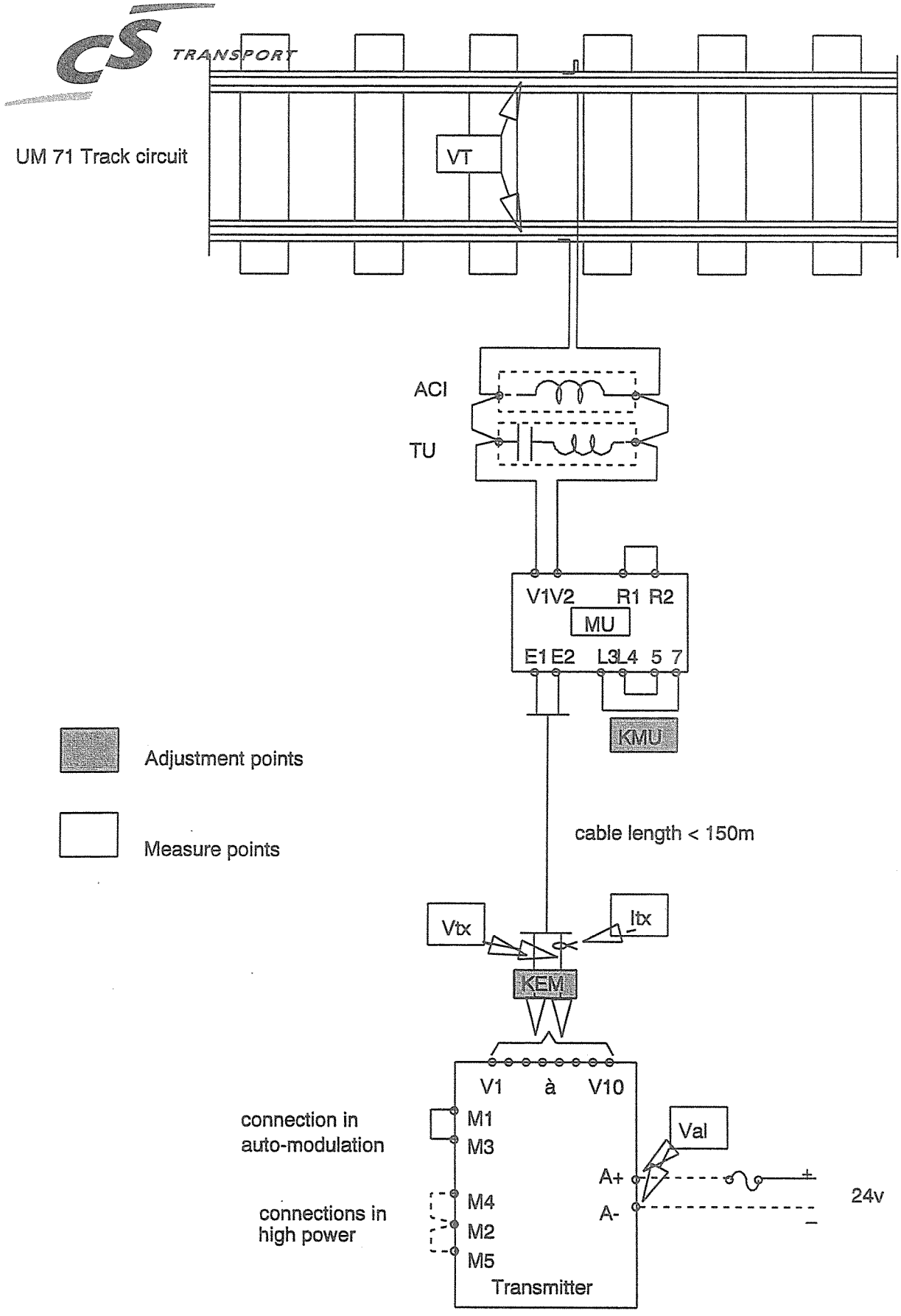
CS TRANSPORT



ERECTING PLAN ACI / TU

DETAIL OF ASSEMBLING

A049

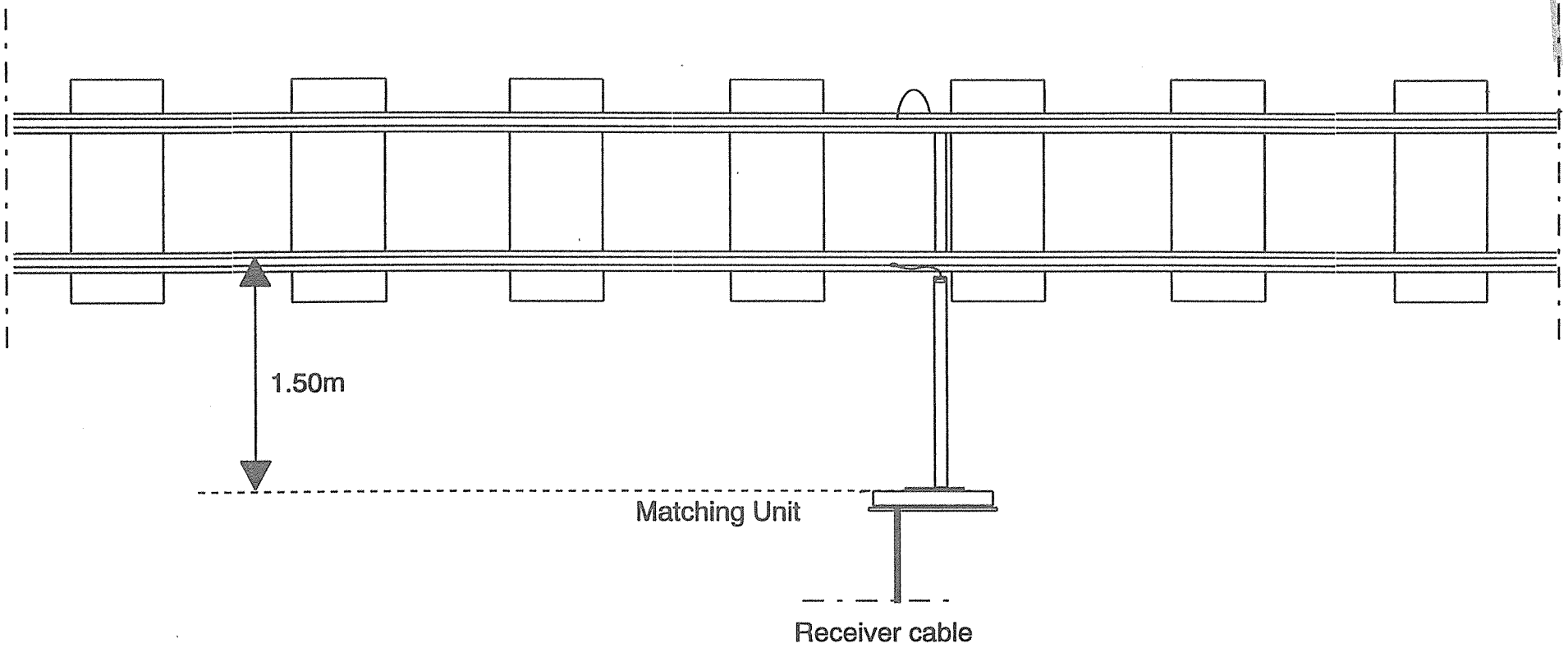


INTERMEDIATE TRANSMISSION - IT

Cabling, measure and adjustment points

A057

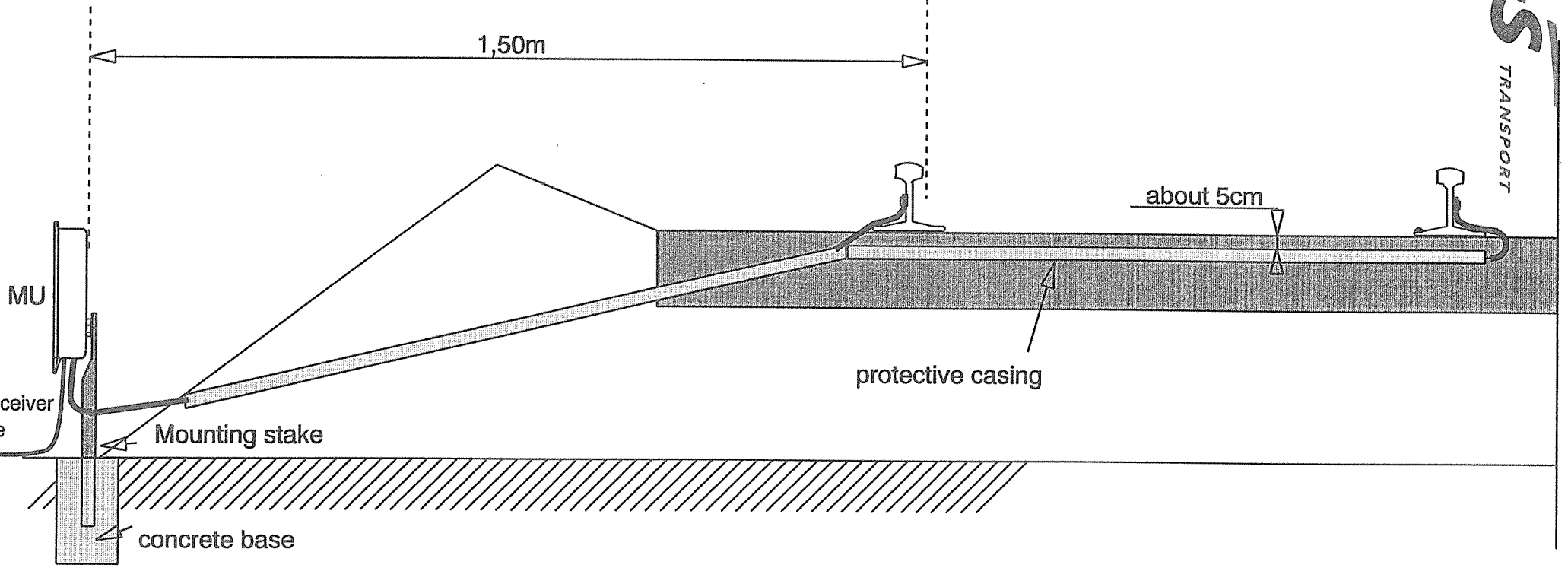
APPENDIX 24



INTERMEDIATE DATA COLLECTOR -IDC

Information Point - IP - Configuration

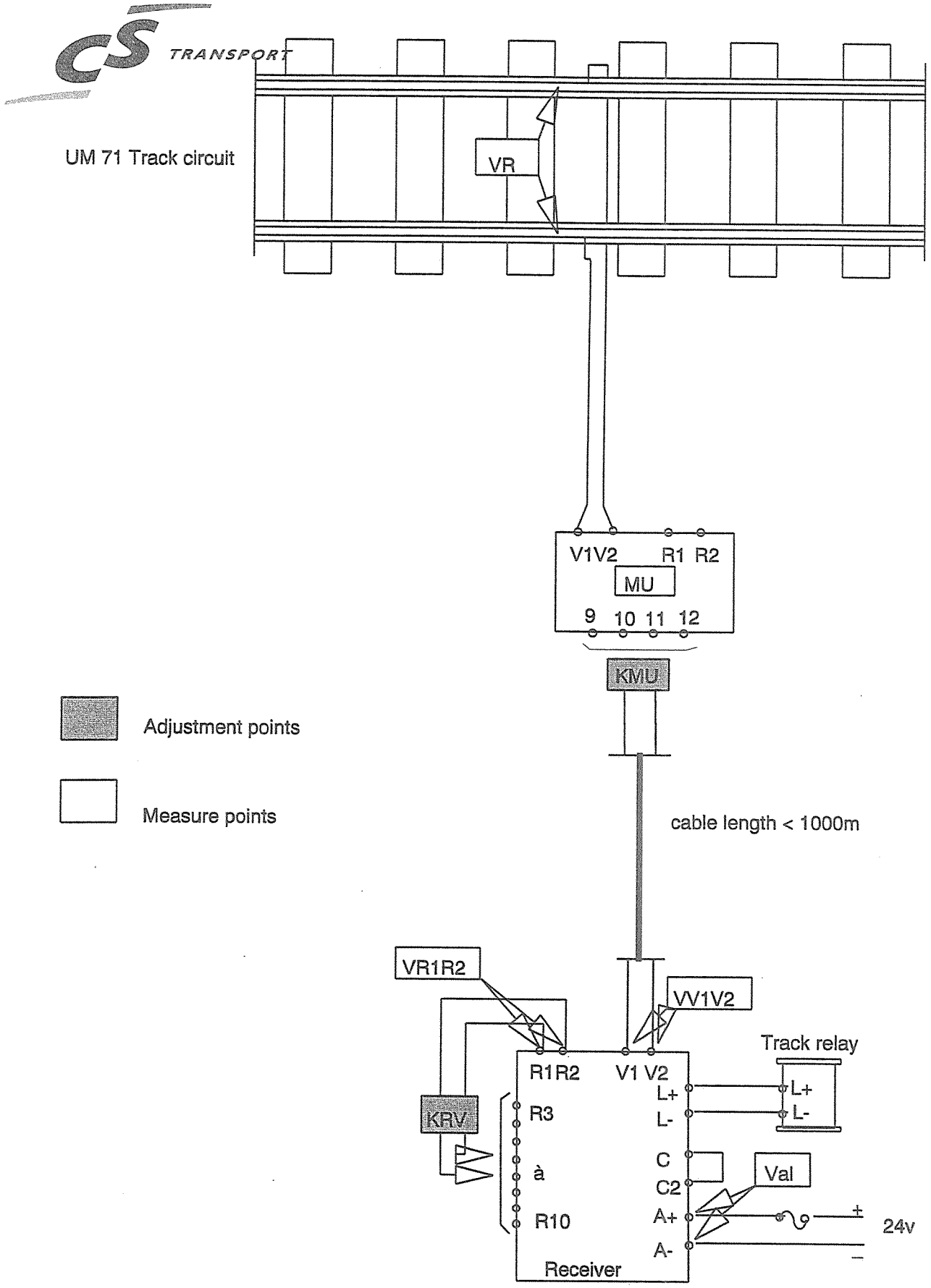
A017



INTERMEDIATE DATA COLLECTOR - IDC

ERECTING PLAN - Matching Unit - MU

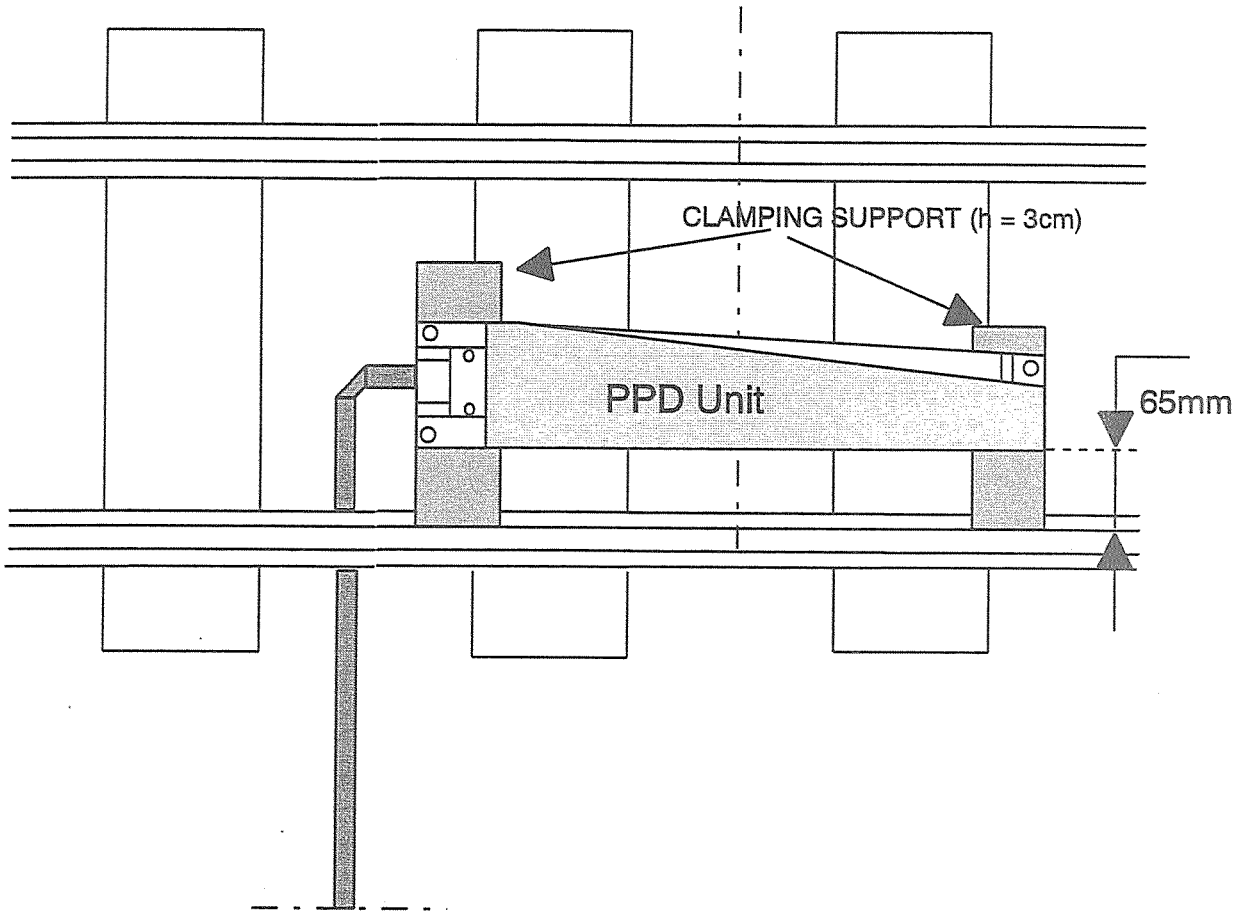
A059



INTERMEDIATE DATA COLLECTOR - IDC
INFORMATION POINT - IP

Cabling, measure and adjustment points

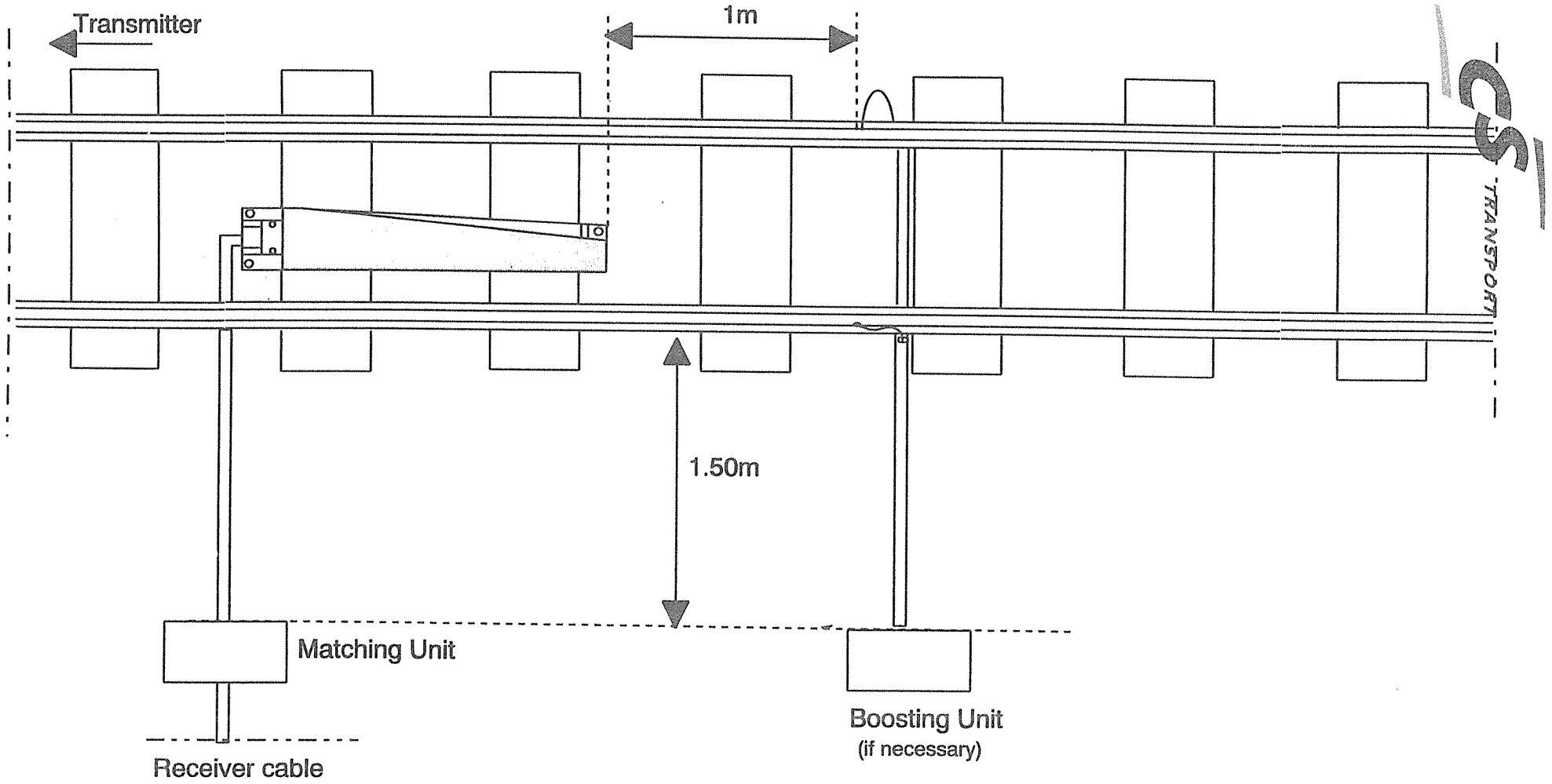
A058



ERECTING PLAN PPDU

DETAIL OF INSTALLATION

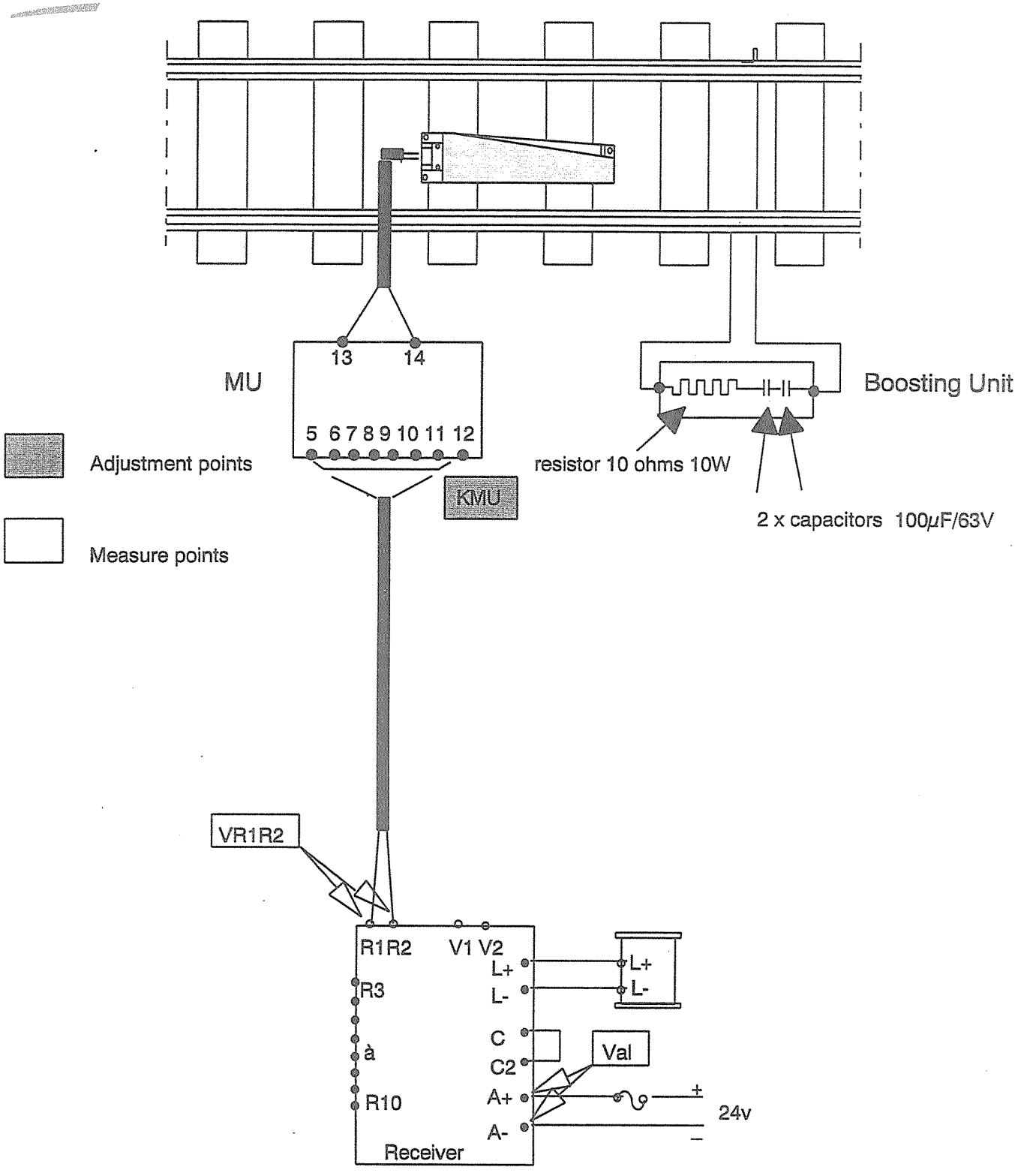
A069



INTERMEDIATE DATA COLLECTOR -IDC

Pin Point Detector - PPD

A018

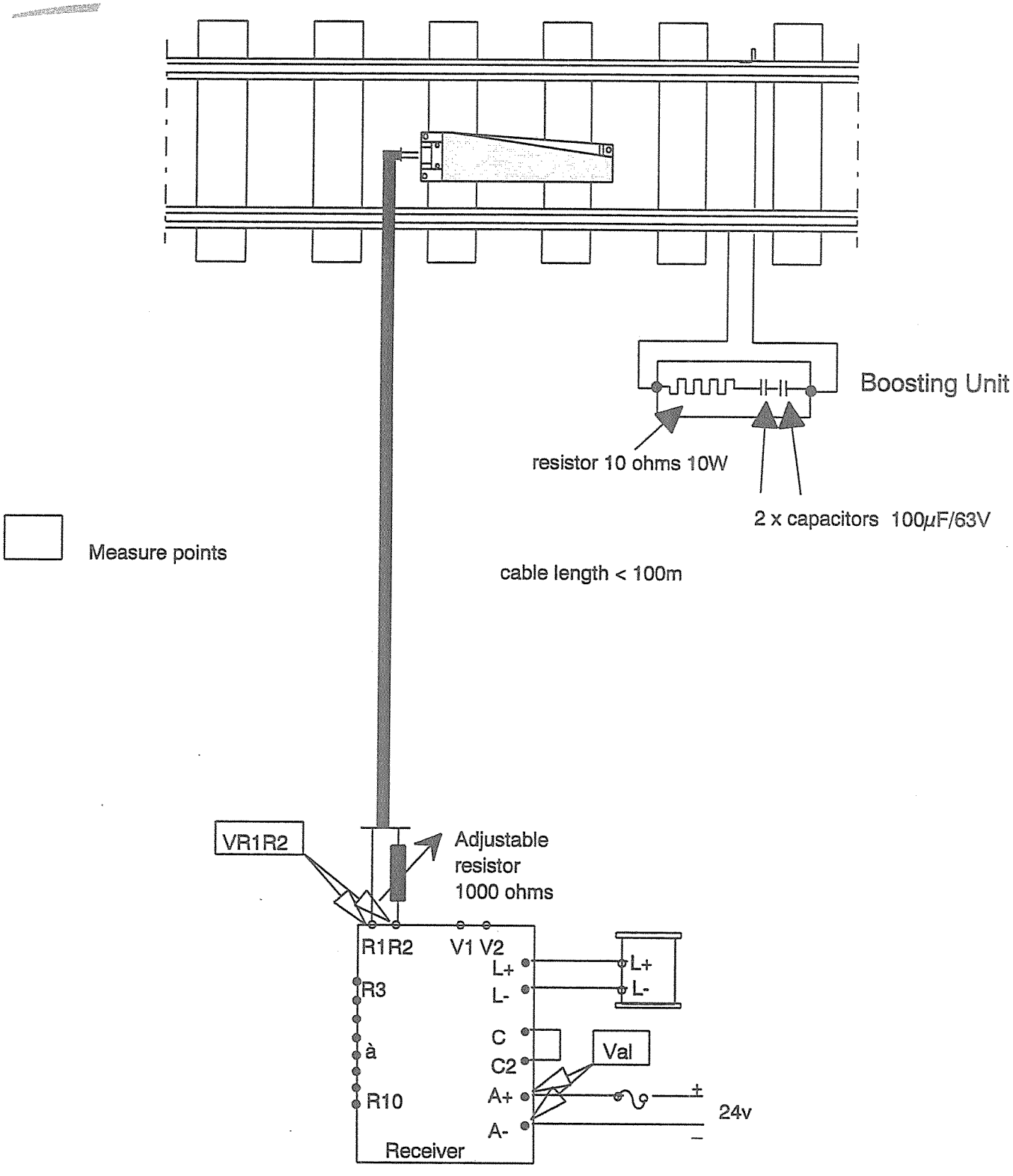


INTERMEDIATE DATA COLLECTOR (IDC)

PIN POINT DETECTOR (PPD) with MU

Cabling, measure and adjustment points

A070A



INTERMEDIATE DATA COLLECTOR (IDC)

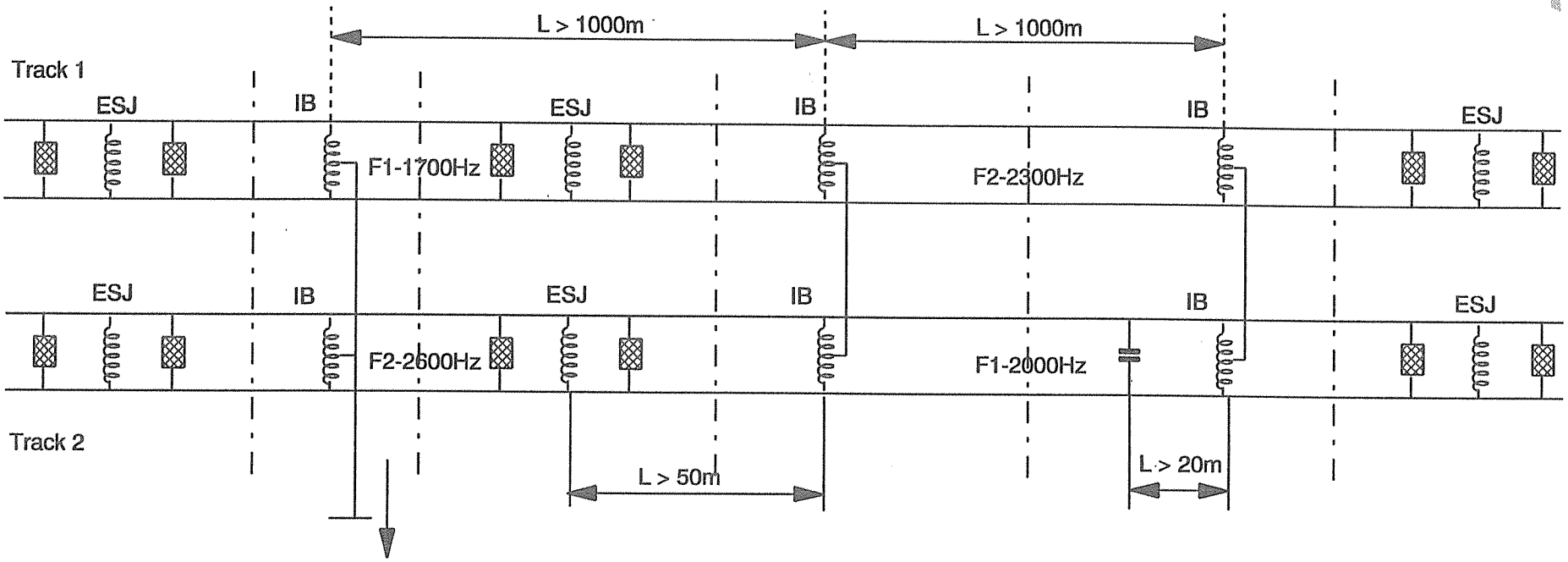
PIN POINT DETECTOR (PPD) without MU

Cabling, measure and adjustment points

A070

CS TRANSPORT

APPENDIX 25



EXTERNAL LINKS

A100

APPENDIX 26

CS TRANSPORT

ELTEL LIGHTNING ARRESTER

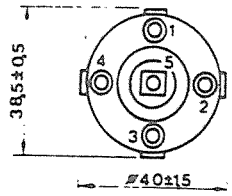
SELCS PLOTTING MULTIPLE SURGE ARRESTER

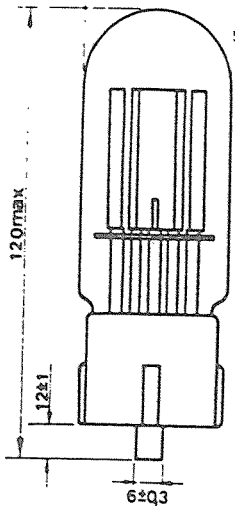
model SNCF 79600727 120 A 500 V

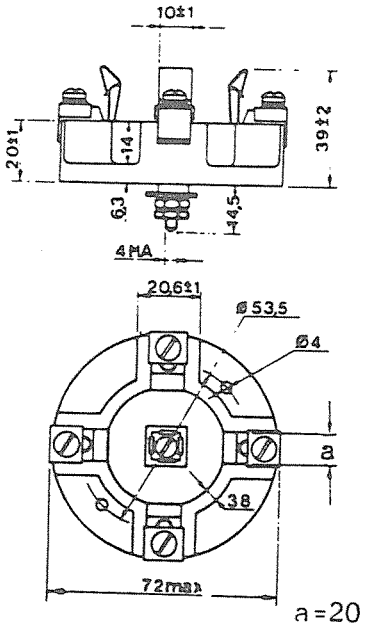
Breakdown voltage at 50 Hz (r.m.s. value) [0]		500 V ± 20%
Surge breakdown time lag with 1/50 waveform and 2kV peak voltage		<1 µs
Nominal discharge current (for 4 s. max) [00]		120 A
Arc voltage (r.m.s. value) for a total discharge current at 50Hz of: [00]	4 A	≤40 V
	10 A	≤25 V
	120 A	≤ 6 V
Line to earth electrode capacitance Line to line electrode capacitance		≤5,5 pF ≤4 pF
Isolation resistance		≥20,000 MΩ
Current maximum ratings of surge arrester	with 50Hz alternating current	10 discharges of 120 A [00] lasting 1s. every 3mn.
	with 10/20 waveform	50 strokes of 5kA every 3 mn.

[0] Measured with 2 opposite line electrodes in parallel
[00] Equally distributed on the 4 line electrodes

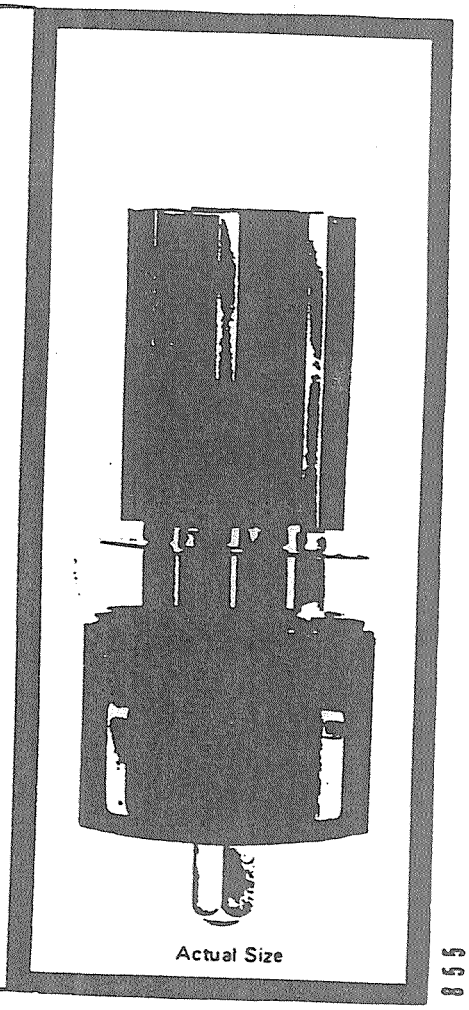
MECHANICAL DATA - Dimensions in mm







Standard Socket
7 960 0352



855

Electronix

CS TRANSPORT

TRANSIENT VOLTAGE SUPPRESSOR

MODEL 1.5KE200

General Semiconductor Industries, Inc.

SQUARE D COMPANY

TRANSZORB™ TRANSIENT VOLTAGE SUPPRESSORS

1N6267 THRU 1N6303A — 1.5KE6.8 THRU 1.5KE400A

FEATURES

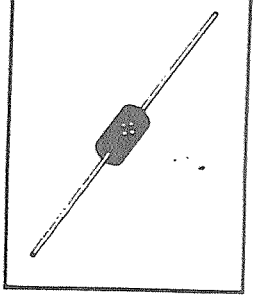
- 1500 watts Peak Pulse Power dissipation
- Fast Response
- Available in ranges from 6.8 to 400 volts
- Bipolar types available
- UL Recognized (1.5KE200CA and 1.5KE220CA)
- Each device 100% tested

APPLICATION

This series of Silicon Transient Suppressors is used in applications where large voltage transients can permanently damage voltage-sensitive components.

The TransZorb® diode can be used in applications where induced lightning on rural or remote transmission lines presents a hazard to electronic circuitry (ref: R.E.A. specification P.E. 60).

CASE 1



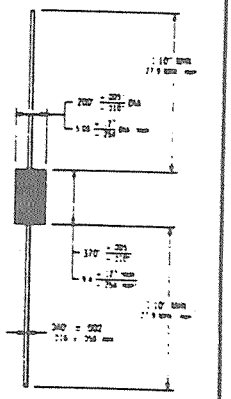
MAXIMUM RATINGS

- 1500 Watts of Peak Pulse Power dissipation at 25°C
- Operating and Storage temperatures: −65° to +175°C
- Forward surge current 200A, 1/120 sec half cycle @ 25°C (Unidirectional only)
- Steady State power dissipation: 5.0 watts at T_L = 75°C, Lead Length = ⅜"

DESCRIPTION

This TransZorb diode has a peak pulse power rating of 1500 watts for one millisecond. The response time of TransZorb diode clamping action is theoretically instantaneous (1×10^{-12} sec); therefore, they can protect Integrated Circuits, MOS devices, Hybrids, and other voltage-sensitive semiconductors and components. TransZorb diodes can also be used in series or parallel to increase the peak power ratings.

CASE OUTLINE



MECHANICAL CHARACTERISTICS

- Molded Case
- Weight: 1.5 grams (approximate)
- Positive terminal marked with band (unidirectional only)
- Body marked with Logo and type number

ELECTRICAL CHARACTERISTICS

Clamping Factor: 1.33 at full rated power
1.20 at 50% rated power

Clamping Factor: The ratio of the actual V_C (Clamping Voltage) to the BV (Breakdown Voltage) as measured on a specific device

FIGURE 1—Peak Pulse Power vs. Pulse Time

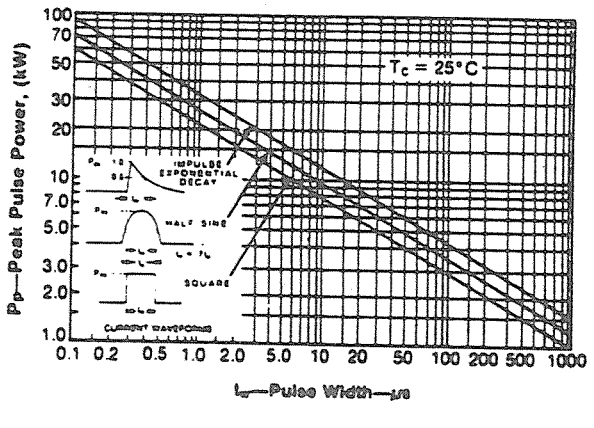
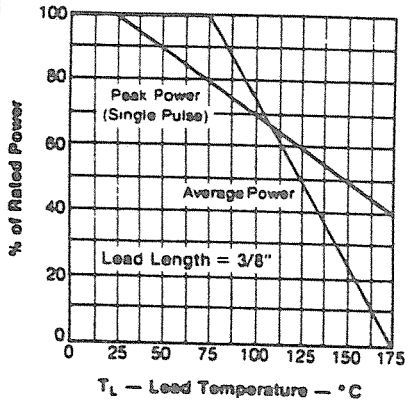


FIGURE 2—Power Derating



TransZorb®
UNIPOLAR & BIPOLAR

1N6267 THRU 1N6303A — 1.5KE6.8 THRU 1.5KE400A

ELECTRICAL CHARACTERISTICS @ 25°C

JEDEC TYPE NUMBER	GENERAL SEMICONDUCTOR PART NUMBER (NOTE 1)	REVERSE STAND-OFF VOLTAGE (NOTE 2) V_R Volts	BREAKDOWN VOLTAGE V_{BR} @ I_T MIN.	MAX.	I_T mA	MAXIMUM REVERSE LEAKAGE @ V_R (NOTE 3) I_R µA	MAXIMUM CLAMPING VOLTAGE @ I_{PP} V_C Volts	I_{PP} Amps	MAXIMUM VOLTAGE TEMPERATURE VARIATION OF V_{BR} (Positive) mV/°C
1N6267	1.5KE6.8 *	5.80	6.12 -	7.48	10	1000	10.8	139.0	5.0
1N6267A	1.5KE6.8A *	5.80	6.45 -	7.14	10	1000	10.5	143.0	5.0
1N6268	1.5KE7.5	6.40	6.75 -	8.25	10	500	11.7	128.0	5.0
1N6268A	1.5KE7.5A	6.40	7.13 -	7.88	10	500	11.3	133.0	5.0
1N6269	1.5KE8.2	7.02	7.38 -	9.02	10	200	12.5	120.0	6.0
1N6269A	1.5KE8.2A	7.02	7.79 -	8.61	10	200	12.1	124.0	6.0
1N6270	1.5KE9.1	7.78	8.19 -	10.00	1	50	13.4	112.0	7.0
1N6270A	1.5KE9.1A	7.78	8.65 -	9.55	1	50	13.4	112.0	7.0
1N6271	1.5KE10	8.55	9.00 -	11.00	1	10	14.5	103.0	8.0
1N6271A	1.5KE10A	8.55	9.50 -	10.50	1	10	14.5	103.0	8.0
1N6272	1.5KE11	9.40	9.90 -	12.10	1	5	15.8	95.0	9.0
1N6272A	1.5KE11A	9.40	10.50 -	11.60	1	5	15.6	96.0	9.0
1N6273	1.5KE12	9.72	10.80 -	13.20	1	5	17.3	87.0	10
1N6273A	1.5KE12A	10.20	11.40 -	12.60	1	5	16.7	90.0	10
1N6274	1.5KE13	10.50	11.70 -	14.30	1	5	18.8	79.6	11
1N6274A	1.5KE13A	11.10	12.40 -	13.70	1	5	18.2	82.0	11
1N6275	1.5KE15	12.10	13.50 -	16.50	1	5	22.0	68.0	13
1N6275A	1.5KE15A	12.80	14.30 -	15.80	1	5	21.2	71.0	12
1N6276	1.5KE16	12.80	14.40 -	17.60	1	5	23.6	64.0	16
1N6276A	1.5KE16A	13.60	15.20 -	16.80	1	5	22.5	67.0	14
1N6277	1.5KE18	14.50	16.20 -	19.80	1	5	25.5	59.5	17
1N6277A	1.5KE18A	15.30	17.10 -	18.90	1	5	25.2	59.5	19
1N6278	1.5KE20	16.20	18.00 -	22.00	1	5	28.1	51.5	20
1N6278A	1.5KE20A	17.10	19.00 -	21.00	1	5	27.7	54.0	19
1N6279	1.5KE22	17.80	19.80 -	24.20	1	5	31.9	47.0	21
1N6279A	1.5KE22A	18.80	20.90 -	23.10	1	5	30.6	49.0	20
1N6280	1.5KE24	19.40	21.60 -	26.40	1	5	34.7	43.0	25
1N6280A	1.5KE24A	20.50	22.80 -	25.20	1	5	33.2	45.0	23
1N6281	1.5KE27	21.80	24.30 -	29.70	1	5	38.1	39.5	28
1N6281A	1.5KE27A	23.10	25.70 -	28.40	1	5	37.5	40.0	25
1N6282	1.5KE30	24.20	27.00 -	33.00	1	5	43.5	34.5	31
1N6282A	1.5KE30A	25.60	28.50 -	31.50	1	5	41.4	36.0	28
1N6283	1.5KE33	26.80	29.70 -	36.30	1	5	47.7	31.5	31
1N6283A	1.5KE33A	28.20	31.40 -	34.70	1	5	45.7	33.0	30
1N6284	1.5KE36	29.10	32.40 -	39.60	1	5	52.0	29.0	35
1N6284A	1.5KE36A	30.80	34.20 -	37.80	1	5	49.9	30.0	31
1N6285	1.5KE39	31.60	35.10 -	42.90	1	5	56.4	26.5	39
1N6285A	1.5KE39A	33.30	37.10 -	41.00	1	5	53.9	28.0	36
1N6286	1.5KE43	34.80	38.70 -	47.30	1	5	61.9	24.0	46
1N6286A	1.5KE43A	36.80	40.90 -	45.20	1	5	59.3	25.3	44
1N6287	1.5KE47	38.10	42.30 -	51.70	1	5	67.8	22.2	50
1N6287A	1.5KE47A	40.20	44.70 -	49.40	1	5	64.8	23.2	48
1N6288	1.5KE51	41.30	45.90 -	56.10	1	5	73.6	20.4	55
1N6288A	1.5KE51A	43.60	48.50 -	53.60	1	5	70.1	21.4	51
1N6289	1.5KE56	47.80	50.40 -	61.60	1	5	80.5	18.6	58
1N6289A	1.5KE56A	47.80	53.20 -	58.80	1	5	77.0	19.5	56
1N6290	1.5KE62	50.20	55.80 -	68.20	1	5	89.0	16.9	65
1N6290A	1.5KE62A	53.00	58.90 -	65.10	1	5	85.0	17.7	62
1N6291	1.5KE68	55.10	61.20 -	74.80	1	5	98.0	15.3	71
1N6291A	1.5KE68A	58.10	64.60 -	71.40	1	5	92.0	16.3	69
1N6292	1.5KE75	60.70	67.50 -	82.50	1	5	108.0	13.9	80
1N6292A	1.5KE75A	64.10	71.30 -	78.80	1	5	103.0	14.6	76
1N6293	1.5KE82	66.40	73.80 -	90.20	1	5	118.0	12.7	90
1N6293A	1.5KE82A	70.10	77.90 -	86.10	1	5	113.0	13.3	86
1N6294	1.5KE91	73.70	81.90 -	100.00	1	5	131.0	11.4	99
1N6294A	1.5KE91A	77.80	86.50 -	95.50	1	5	126.0	12.0	94
1N6295	1.5KE100	81.00	90.00 -	110.00	1	5	144.0	10.4	109
1N6295A	1.5KE100A	85.50	95.00 -	105.00	1	5	137.0	11.0	104
1N6296	1.5KE110	89.20	99.00 -	121.00	1	5	158.0	9.5	120
1N6296A	1.5KE110A	94.00	105.00 -	116.00	1	5	152.0	9.9	115
1N6297	1.5KE120	97.20	108.00 -	132.00	1	5	173.0	8.7	131
1N6297A	1.5KE120A	102.00	114.00 -	126.00	1	5	165.0	9.1	125
1N6298	1.5KE130	105.00	117.00 -	143.00	1	5	187.0	8.0	142
1N6298A	1.5KE130A	111.00	124.00 -	137.00	1	5	179.0	8.4	136
1N6299	1.5KE150	121.00	135.00 -	165.00	1	5	215.0	7.0	164
1N6299A	1.5KE150A	128.00	143.00 -	158.00	1	5	207.0	7.2	157
1N6300	1.5KE160	130.00	144.00 -	176.00	1	5	230.0	6.5	175
1N6300A	1.5KE160A	136.00	152.00 -	168.00	1	5	219.0	6.8	167
1N6301	1.5KE170	138.00	153.00 -	187.00	1	5	244.0	6.2	186
1N6301A	1.5KE170A	145.00	162.00 -	179.00	1	5	234.0	6.4	188
1N6302	1.5KE180	146.00	162.00 -	198.00	1	5	258.0	5.8	197
1N6302A	1.5KE180A	154.00	171.00 -	189.00	1	5	246.0	6.1	188
1N6303	1.5KE200	162.00	180.00 -	220.00	1	5	287.0	5.2	219
1N6303A	†1.5KE200A	171.00	190.00 -	210.00	1	5	274.0	5.5	209
	1.5KE220	175.00	198.00 -	242.00	1	5	344.0	4.3	240
	†1.5KE220A	185.00	209.00 -	231.00	1	5	328.0	4.6	230
	1.5KE250	202.00	225.00 -	275.00	1	5	359.0	5.0	270
	1.5KE250A	214.00	237.00 -	263.00	1	5	344.0	5.0	260
	1.5KE300	243.00	270.00 -	330.00	1	5	430.0	5.0	330
	1.5KE300A	256.00	285.00 -	315.00	1	5	414.0	5.0	315
	1.5KE350	284.00	315.00 -	385.00	1	5	504.0	4.0	385
	1.5KE350A	300.00	333.00 -	368.00	1	5	482.0	4.0	368
	1.5KE400	324.00	360.00 -	440.00	1	5	574.0	4.0	440
	1.5KE400A	342.00	380.00 -	420.00	1	5	548.0	4.0	420

* Devices listed 1.5KE200CA and 1.5KE220CA † Not available as bipolar

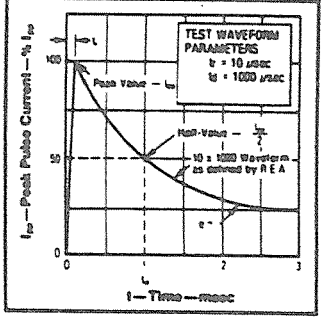
ABBREVIATIONS & SYMBOLS

- V_R Stand-Off Voltage Applied Reverse Voltage to assure a nonconductive condition (See Note 2)
- V_{BR} Breakdown Voltage
- $V_{C(max)}$ Maximum Clamping Voltage The maximum peak voltage appearing across the TransZorb suppressor when subjected to the peak pulse current in a one millisecond time interval. The peak pulse voltage is the sum of a voltage rise due to diode series resistance and an increase in breakdown voltage caused by the junction temperature rise
- I_{PP} Peak Pulse Current—See Figure 3
- P_P Peak Pulse Power
- I_R Reverse Leakage
- ΔV_C Rise in voltage above the breakdown voltage caused by current flow

NOTES

1. Part numbers shown are for unipolar devices Add C or CA suffix to specify bipolar suppressors 1.5KE6.8 is available as unipolar only
2. A Transzorb suppressor is normally selected according to the reverse Stand-Off Voltage (V_R) which should be slightly greater than the maximum dc or continuous peak operating voltage level
3. For bipolar types having V_R of 10 volts and under the I_R limit is doubled
4. For unipolar diodes $V_{F(max)}$ 3.5V at I_F 100A for 8.3ms sine wave

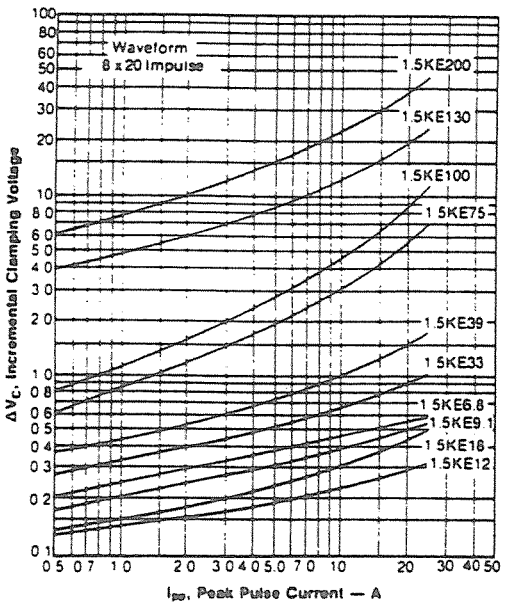
FIGURE 3—Pulse Waveform



CLAMPING VOLTAGE 8 x 20 IMPULSE

$\Delta V_C = V_C - V_{BR}$

FIGURE 4—Unidirectional



CLAMPING VOLTAGE 10 x 1000 IMPULSE

$\Delta V_C = V_C - V_{BR}$

FIGURE 5—Unidirectional

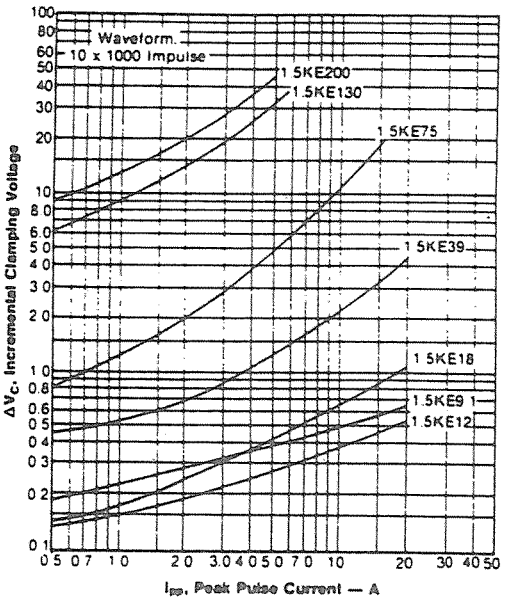


FIGURE 6—Bidirectional

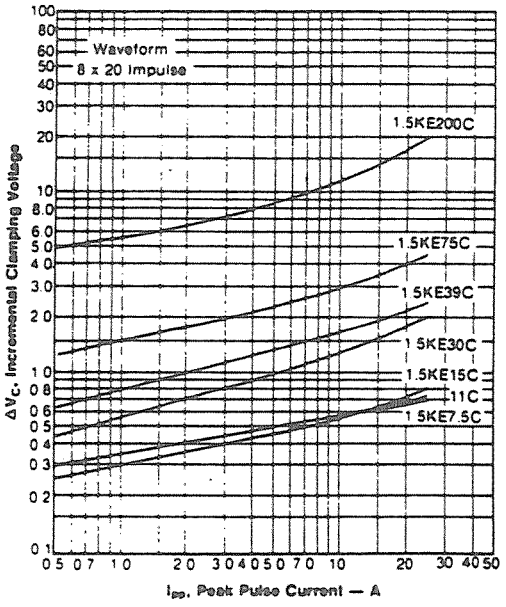
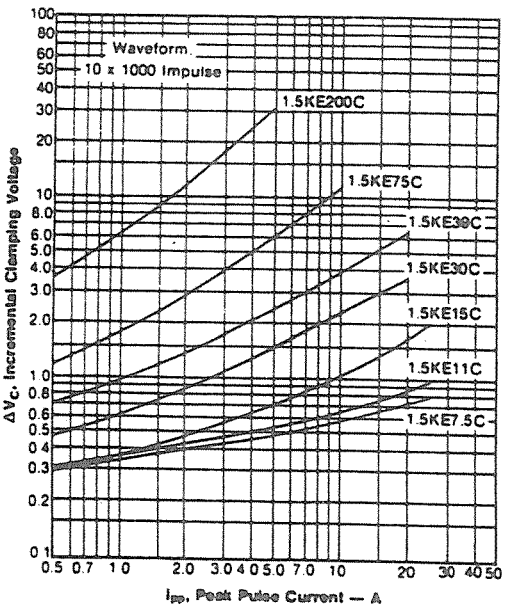


FIGURE 7—Bidirectional



TYPICAL ELECTRICAL CHARACTERISTICS

FIGURE 8—Capacitance

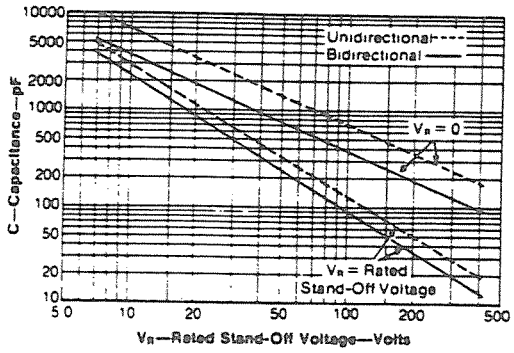


FIGURE 9—Forward Voltage

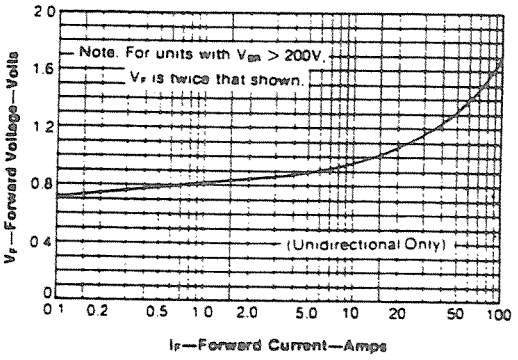


FIGURE 10—Model Parameters

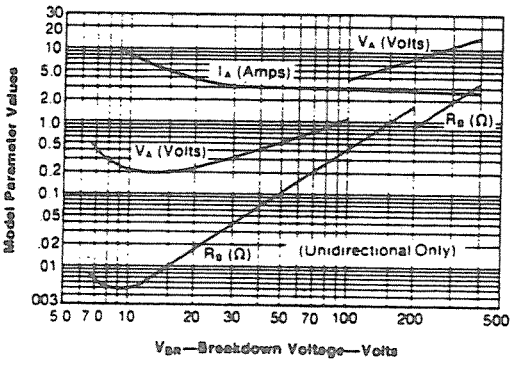


FIGURE 11
Breakdown Voltage Temperature Coefficient

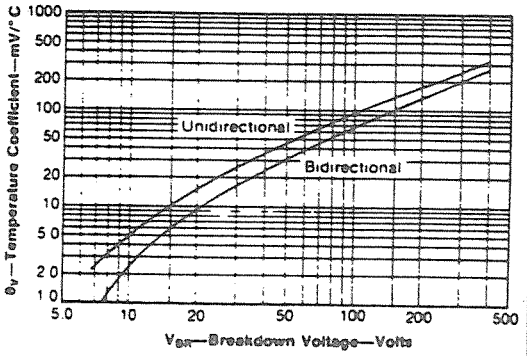
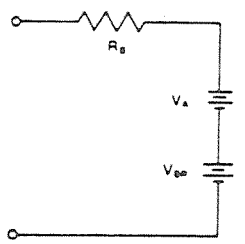


FIGURE 12—High Current Model



Over a restricted current range, TransZorb® diodes may be modeled as shown in the adjoining figure. The battery V_{BO} represents the breakdown voltage, the battery V_A represents the effect of avalanche resistance, and the resistance R_S represents the bulk silicon resistance. At a critical current I_A, the incremental avalanche resistance, which is inversely proportional to current, becomes negligible, its net effect is represented by the battery V_A. The voltage at currents above I_O is obtained by adding a term $R_S \times I_{PP}$ to the sum of the battery voltages. Values for the model parameters are shown on Figure 10. The model is not valid for bidirectional suppressors.

The major effect of temperature is upon the breakdown voltage, V_{BR}. It is adjusted by adding a term $\Theta_V (T_J - 25°C)$. Values for Θ_V are shown in Figure 11. T_J is calculated using standard techniques.

CS TRANSPORT

TRANSIENT VOLTAGE SUPPRESSOR

MODEL V130LA20A

CS TRANSPORT

GE-M[redacted]tal-Oxide Varistors

GE has been helping customers solve transient voltage problems since the introduction of GE-MOV® varistors in 1972. The GE-MOV® team is constantly researching the causes and effects of transients and developing new solutions to meet all types of transient suppression needs; committed to innovation beyond today's technology.

As the field of electronics has grown rapidly through the use of solid-state components, so have the applications for surge suppressors to protect these transient-sensitive devices. Innovations such as surface-mount technology have also altered the demand profile by adding packaging considerations to functional ones.

As a result of innovation and research, the GE-MOV® line of metal-oxide varistors has expanded to include surface-mount devices, new high-energy packages, connector-pin varistors, and high-temperature, low-profile varistors. These new products supplement the GE-MOV® line of radial, axial, and high-energy packaged varistors, already the broadest in the industry.

GE-MOV® Specification Guide

CH	13
SM	14, 15
CP	16
MA	17
ZA	18, 19
LA	20
RA	21, 22
PA	23
DA/DB	24
BA/BB	24
CA	25
High Reliability	26

GE-MOV® Features

FAMILY FEATURES:
- Wide Voltage/Energy Range
- Excellent Clamp Ratio
- Power
- No Follow-On Current
- Fast Response Time
- Low Standby
- UL Recognized

TYPE FEATURES:

CH/SM Series
Surface Mount Varistors
- Better Performance
- Higher Reliability
- Lower Equipment Cost
- Saves on Board Height/Bulk/Weight

CP Series
Connector Pin Varistors
- Provides transient protection in connectors
- Available in 22, 20, and 16 gauge sizes

MA Series
- Axial Package
- Wide Voltage Range
- Automatic Insertion

ZA Series
- Radial Package
- Low Voltage Operation

LA Series
- Radial Package
- Line Voltage Operation
- UL Recognized

RA Series
- Low Profile
- High Temperature Capability
- Precise Seating Plane
- In-Line Leads

PA Series
- Rigid Mountdown
- NEMA Creep and Strike Distance
- Quick Connect Terminal
- UL Recognized

DA,DB,BA,BB Series
- High Energy Capability
- Rigid Terminals
- Isolated
- Low Inductance
- Improved Creep and Strike
- UL Recognized

CA Series
- Industrial Discs

HI Reliability Series
- 100% Prescreened
- 100% Process Conditioning
- Meets Military Specifications

Concepts of Transient Voltage Protection

Varistor characteristics are measured at high current and energy levels of necessity with an impulse waveform. Shown below is the ANSI STD C62.1 waveshape, an exponentially decaying waveform representative of lightning surges, and the discharge of stored energy in reactive circuits. See Figures 1 and 2.

Based on industry practices, the 8/20μs current wave (8μs rise and 20μs to 50% decay of peak value) is used as a standard for current (I_{tm}) and clamp voltage (V_C) ratings shown in the specification tables and curves. Ratings for other waves of different decay times are shown specifically on the pulse life derating curves.

For the energy rating (W_{tm}), a longer duration waveform of 10/1000μs is used. This condition is more representative of the high energy surges usually experienced from inductive discharge of motors and transformers. GE-MOV® Varistors are rated for a maximum pulse energy surge that results in a varistor voltage ($V_{N(dc)}$) shift of less than ± (10% + IV) of initial value.

To determine the energy absorbed in a varistor the following equation applies:

$$E = KV_{cl}I\tau$$

where I is the peak current applied, V_c is the clamp voltage which results, τ is the pulse width and K is a constant. K values are 1.0 for a rectangular wave, 1.4 for a 10/1000μs wave, and 1.0 for a 8/20μs wave.

Note that the rated energy (W_{tm}) and the energy absorbed in a varistor may not be identical. A specimen with lower clamping voltage will absorb less energy. This effect tends to be greatest at rated peak current (I_{tm}) with an 8/20μs wave.

It is important to note, as demonstrated by the above equation, that poorer varistors must absorb higher energy levels than the better performance varistors with lower clamp voltages, yet they actually provide less over-voltage protection. For that reason, energy ratings based on an 8/20μs pulse tend to overstate varistor capability. The 10/1000μs waveform consequently gives a more realistic energy rating value.

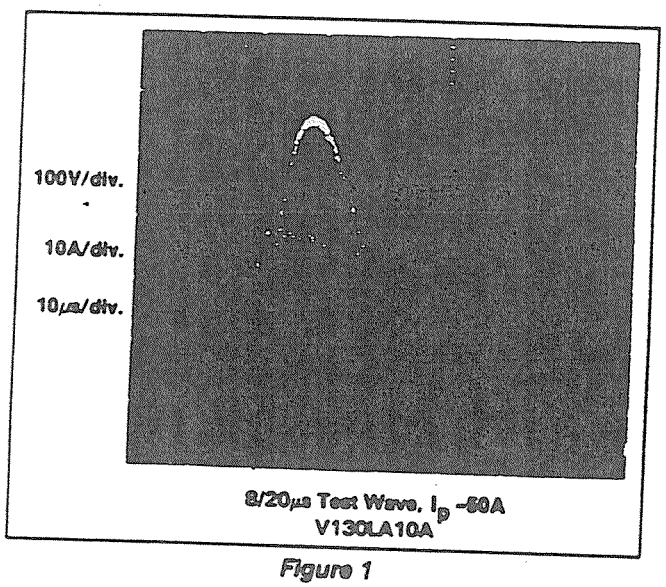


Figure 1

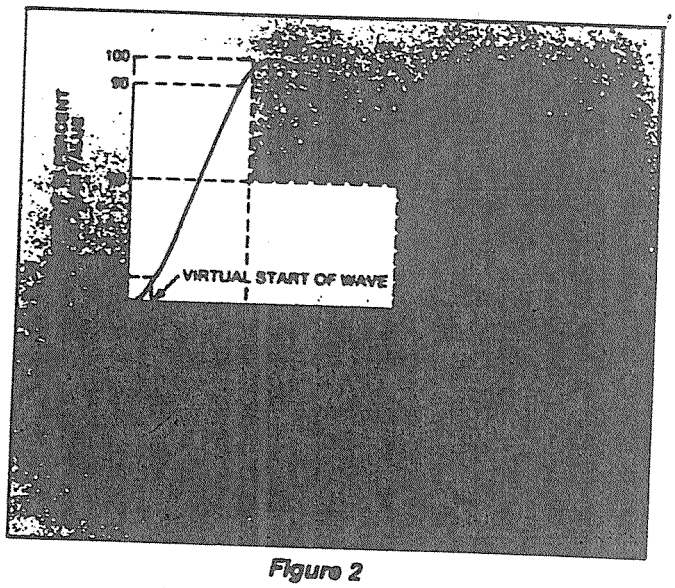


Figure 2

Varistor Safety Precautions

Should the varistor be subjected to surge currents and energy levels substantially above maximum ratings, it may physically fail by package rupture or expulsion of material. It is recommended that protective fusing be used as described in the Transient Voltage Suppression Manual 400.3 10/86 5th Edition. If not fused, the varistor should be located away from other components or be physically shielded from them.

GE-MOV® Varistor encapsulant complies with flammability requirements of Underwriters Laboratories Standard UL 1414.

Speed of Response

The measured response time of a varistor is influenced by lead configuration and length. In a typical application, the response time is shorter than the inductive lead effect. In a coaxial configuration, one could show response times of less than a few nanoseconds.

Table 1 — Term Definitions

Term	
DC Voltage, $V_{m(dc)}$	Maximum allowable steady state dc applied voltage, DC standby current, I_D = 20μA typical, 200μA maximum at T_A = 25°C, except V18ZA to V36ZA 20mm size: I_D = 200μA (TYP), 3mA max.
RMS Voltage, $V_{m(ac)}$	Maximum allowable steady state sinusoidal voltage (RMS) at 50-60Hz. If a nonsinusoidal waveform is applied, the recurrent peak voltage should be limited to $\sqrt{2}/V_{m(ac)}$.
Energy, W_{tm}	Maximum allowable energy for a single impulse of 10/1000μs current waveform. Energy rating based on a V_N shift of less than ±10%, ±1V of initial value.
Peak Current, I_{tm}	Maximum allowable peak current for a single impulse of 8/20μs waveform with rated continuous voltage applied.
Varistor Voltage, $V_{N(dc)}$	Varistor peak terminal voltage measured with a specified current applied. For dc conditions, 1mA is applied for a duration of 20ms to 5s. For ac conditions 1mA peak 60Hz wave is applied.
	Maximum terminal voltage measured with an applied 8/20μs impulse of a given peak current. See characteristic tables for product ratings of clamping voltage over the allowable range of peak impulse current starting on page 13.
	Typical values measured at a test frequency of 1.0 MHz. Maximum capacitance can be 100% higher than the typical value measured at 1.0 MHz.

Table 2 — Varistor Product Family Selection Guide

		VOLTS AC RMS: 4 10 25 — 130 150 — 250 275 — 660 750 — 1000 — 2800 (264)
		VOLTS DC: 5.5 14 35 — 175 200 — 330 369 — 850 970 — 1200 — 3500 (365)
250-500	1.5-5.0	22, 20 16 GAUGE
100-6500	0.4-160	5x8 10x16 14x22mm
40-100	0.07-1.7	3mm
25-4500	0.1-35	5 7 10 14 20mm
25-6500	0.4-160	5x8 10x16 14x22mm
→ 1200-6500	11-360	7 10 14 20mm
6500	70-250	20mm
30,000-40,000	270-1050	40mm 40mm
50,000-70,000	450-10,000	60mm
20,000-70,000	200-10,000	32, 40, 60mm

Table 3 — Family Characteristics

Operating Ambient Temperature (w/out derating)	-55 to +85°C	-55 to +85°C	-55 to +125°C	-55 to +85°C	-55 to +85°C	-40 to +85°C*	-55 to +85°C	-55 to +75°C	-55 to +75°C
Storage Temperature	-55 to +200°C	-55 to +150°C	-55 to +200°C	-55 to +125°C	-55 to +150°C	-40 to +125°C	-55 to +125°C	-55 to +125°C	-55 to +125°C
† HiPot Encapsulation, Volts dc For 1 Minute	NA	2500	NA	2500	1000	NA	5000	5000	NA
Voltage Temperature Coefficient (V_C at Specified Test Current)	<.01%/°C	<.01%/°C	<.01%/°C	<.01%/°C	<.01%/°C	<.01%/°C	<.01%/°C	<.01%/°C	<.01%/°C
Insulation Resistance (MΩ)	NA	>1000	NA	>1000	>1000	NA	>1000	>1000	NA

*Base Plate Temperature.
Solderability: Per MIL STD 202E, Method 208C.
†Dielectric withstand per MIL STD 202, Method 301, 2500Vdc min.

Table 4 — Surge Voltages and Currents Deemed to Represent the Indoor Environment and Recommended for Use in Designing Protective Systems

A. Long branch circuits and outlets	II	0.5μs - 100kHz	6kV 200A	High impedance(1)	(120V System) —	(240V System) —
				Low impedance(2)	0.8	1.6
B. Major feeders short branch circuits, and load center	III	1.2/50μs 8/20μs	6kV 3kA	High impedance(1)	—	—
				Low impedance(2)	40	80
		0.5μs - 100kHz	6kV 500A	High impedance(1)	—	—
				Low impedance	2	4

Notes: (1) For high-impedance test specimens or load circuits, the voltage shown represents the surge voltage. In making simulation tests, use that value for the open-circuit voltage of the test generator.
(2) For low-impedance test specimens or load circuits, the current shown represents the discharge current of the surge (not the short-circuit current of the power system). In making simulation tests, use that current for the short-circuit current of the test generator.
(3) Other suppressors which have different clamping voltages would receive different energy levels.

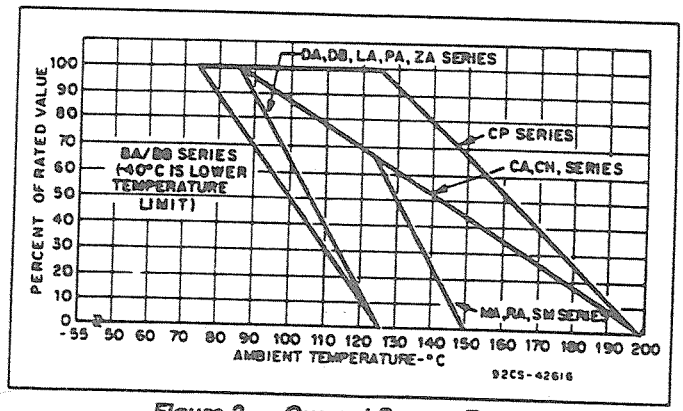


Figure 3 — Current Power, Energy Rating vs. Temperature

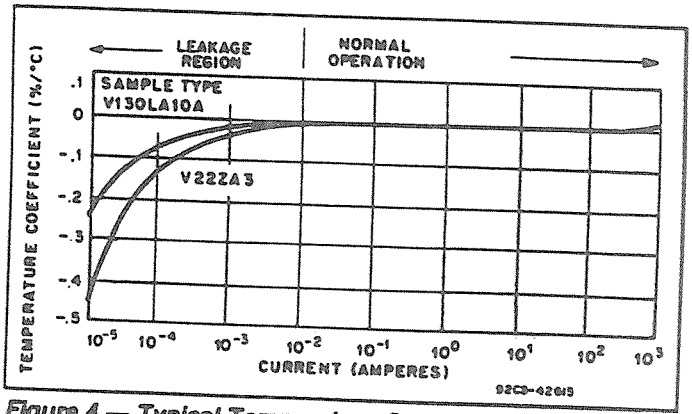
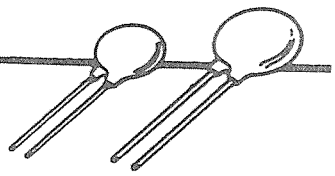


Figure 4 — Typical Temperature Coefficient of Voltage Versus Current 14mm Size, -55 to +125°C

CS TRANSPORT



LA SERIES Ratings and Characteristics (Cont'd)

Series LA Varistors are listed under UL file #E75961 and E56529 as a recognized component.

7, 10, 14, 20mm

Model Number	Model Size Disc Dia. (mm)	Device Marking	Maximum Ratings (25°C)				Electrical Characteristics (25°C)					
			Continuous		Transient							
			RMS Voltage	DC Voltage	Energy (10/1000 μs)	Peak Current (8/20 μs)						
			$V_{m(ac)}$	$V_{m(dc)}$	W_{tm}	I_{tm}	Min.	$V_{N(dc)}$	Max.	V_c	I_p	f=1 MHz
			Volts	Volts	Joules	Amps	Volts	Volts	Volts	Volts	Amps	Picofarads
V130LA1	7	1301	130	175	11	1200	184	200	255	390	10	180
V130LA2	7	1302	130	175	11	1200	184	200	255	340	10	180
V130LA5	10	1305	130	175	20	2500	184	200	228	340	25	450
V130LA10A	14	130L10	130	175	38	4500	184	200	228	340	50	1000
V130LA20A	20	130L20	130	175	70	6500	184	200	228	340	100	1900
V130LA20B	20	130L20B	130	175	70	6500	184	200	220	325	100	1900
V140LA2	7	1402	140	180	12	1200	198	220	242	360	10	160
V140LA5	10	1405	140	180	22	2500	198	220	242	360	25	400
V140LA10A	14	140L10	140	180	42	4500	198	220	242	360	50	900
V150LA1	7	1501	150	200	13	1200	212	240	284	430	10	150
V150LA2	7	1502	150	200	13	1200	212	240	268	395	10	150
V150LA5	10	1505	150	200	25	2500	212	240	268	395	25	360
V150LA10A	14	150L10	150	200	45	4500	212	240	268	395	50	800
V150LA20A	20	150L20	150	200	80	6500	212	240	268	395	100	1600
V150LA20B	20	150L20B	150	200	80	6500	212	240	243	360	100	1600
V175LA2	7	1752	175	225	15	1200	247	270	303	455	10	130
V175LA10A	14	175L10	175	225	55	4500	247	270	303	455	50	700
V230LA4	7	2304	230	300	20	1200	324	360	396	595	10	100
V230LA10	10	230L	230	300	35	2500	324	360	396	595	25	250
V230LA20A	14	230L20	230	300	70	4500	324	360	396	595	50	550
V250LA2	7	2502	250	330	21	1200	354	390	473	730	10	90
V250LA4	7	2504	250	330	21	1200	354	390	429	650	10	90
V250LA10	10	250L	250	330	40	2500	354	390	429	650	25	220
V250LA20A	14	250L20	250	330	72	4500	354	390	429	650	50	500
V250LA40A	20	250L40	250	330	130	6500	354	390	429	650	100	1000
V250LA40B	20	250L40B	250	330	130	6500	354	390	413	620	100	1000
V275LA2	7	2752	275	369	23	1200	389	430	515	775	10	80
V275LA4	7	2754	275	369	23	1200	389	430	473	710	10	80
V275LA10	10	275L	275	369	45	2500	389	430	473	710	25	200
V275LA20A	14	275L20	275	369	75	4500	389	430	473	710	50	450
V275LA40A	20	275L40	275	369	140	6500	389	430	473	710	100	900
V275LA40B	20	275L40B	275	369	140	6500	389	430	453	680	100	900
V300LA2	7	3002	300	405	25	1200	420	470	585	870	10	70
V300LA4	7	3004	300	405	25	1200	420	470	517	775	10	70
V320LA20A	14	320L20	320	420	90	4500	462	510	585	860	50	300
V320LA40B	20	320L40	320	420	160	6500	462	510	540	810	100	700
V420LA10	10	420L	420	560	45	2500	610	680	748	1120	25	200
V420LA20A	14	420L20	420	560	90	4500	610	680	748	1120	50	300
V420LA40B	20	420L40	420	560	160	6500	610	680	720	1080	100	600
V480LA40A	14	480L40	480	640	105	4500	670	750	825	1240	50	270
V480LA80B	20	480L80	480	640	180	6500	670	750	790	1160	100	500
V510LA40A	14	510L40	510	675	110	4500	735	820	910	1340	50	250
V510LA80B	20	510L80	510	675	190	6500	735	820	880	1300	100	450
V575LA40A	14	575L40	575	730	120	4500	805	910	1000	1510	50	220
V575LA80B	20	575L80	575	730	220	6500	805	910	980	1450	100	400
V660LA50A	14	660L50	660	850	140	4500	940	1050	1210	1760	50	200
V660LA100B	20	660L100	660	850	250	6500	940	1050	1100	1650	100	350
V1000LA80A	14	1000L80	1000	1200	220	4500	1425	1600	1800	2600	50	150
V1000LA160B	20	1000L160	1000	1200	360	6500	1425	1600	1600	2400	100	250

NOTE. Power dissipation of transients not to exceed 0.25, 0.4, 0.6, 1.0 watts for sizes 7, 10, 14 and 20mm respectively.

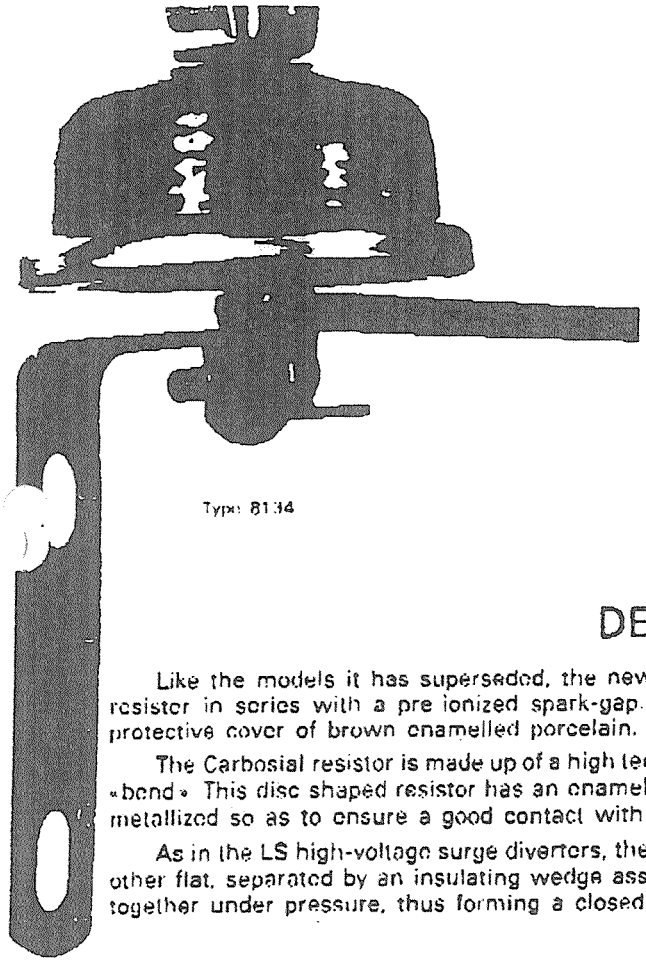
CS TRANSPORT

SOULE LOW VOLTAGE LIGHTNING ARRESTER

CS TRANSPORT

LS LOW VOLTAGE SURGE DIVERTERS

TYPES 8134 & 8137



Type 8134

Low voltage distribution systems are liable to be struck by lightning, which may spread out as far as the customers installations. It is important to protect them efficiently; this can be done inexpensively with our LS surge diverters.

Advances in recent years have resulted in the development of new models with improved characteristics, but preserving their traditional outstanding robustness.

DESCRIPTION

Like the models it has superseded, the new LS non-linear resistor surge diverter is made up of a Carbosial resistor in series with a pre ionized spark-gap. This combination, maintained by a spring, is mounted inside a protective cover of brown enamelled porcelain.

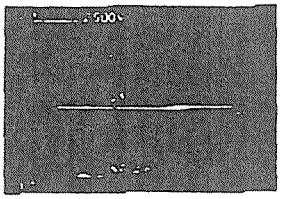
The Carbosial resistor is made up of a high temperature-baked silicon carbide binder having a stable pronounced «band». This disc shaped resistor has an enamelled rounded edge avoiding any risk of flashover. The surfaces are metallized so as to ensure a good contact with the components connected to the terminals.

As in the LS high-voltage surge diverters, the pre-ionized spark-gap comprises two metal discs, one convex, the other flat, separated by an insulating wedge assuring ionization of the explosive gap. The components are bound together under pressure, thus forming a closed spark-gap.

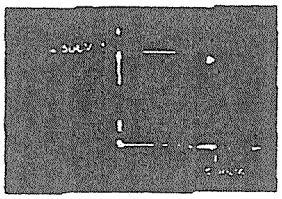
OPERATION

When a voltage surge reaches the surge diverter, the spark-gap pre-ionization is assured by the formation of peripheric discharges at a voltage well below the sparkover voltage. The sparkover therefore occurs without any appreciable time-lag, regardless of the steepness of the incident wavefront. The discharge current flows to earth via the Carbosial non-linear resistor. The latter has a resistivity value which decreases very rapidly as a function of the voltage applied to it, as shown on the U (I) characteristic. A very high current of 4 or 5 kA can thus flow to earth without the instantaneous voltage across the resistor terminals ever exceeding 2,500 V.

After the surge has gone the voltage decreases and approximates to the value of the service voltage. Deionization of the Carbosial non-linear resistor is almost instantaneous. The current assumes such a small value that the follow current is practically zero and that the arc across the spark-gap extinguishes spontaneously as shown on the oscillograms U (t) and I (t).

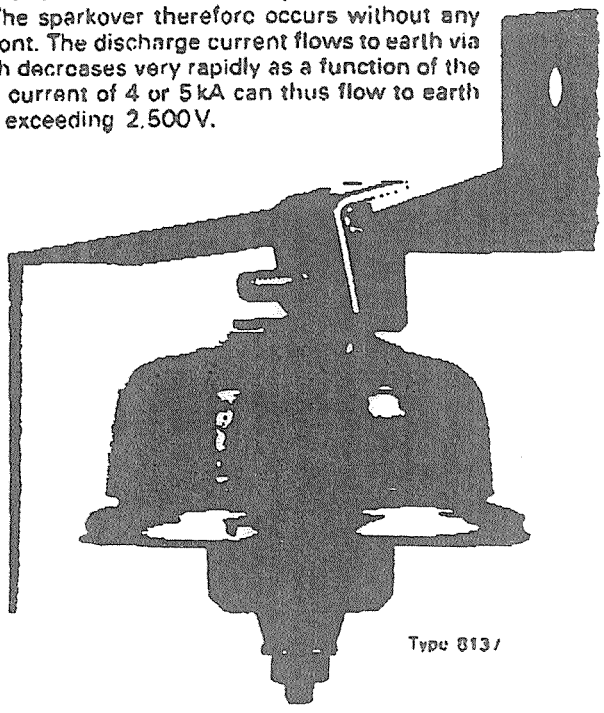


U (t) and I (t) characteristics



U (I) characteristics

Oscillograms for surge diverters LS 8134 and 8137



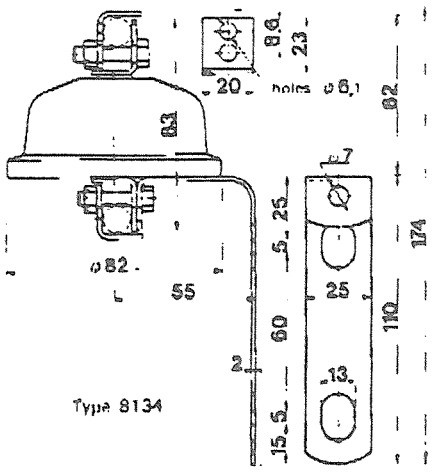
Type 8137

CS TRANSPORT

CHARACTERISTICS

Reliability of operation is such that it has been possible to give LS surge diverters, designed for a standard maximum service voltage of 0.5 kV, the same characteristics as those of surge diverters designed for a standard voltage of 0.28 kV. We have therefore been in a position to make a single model for 0.5 kV and 0.28 kV which can be used in any low-voltage distribution system, whatever its service voltage, up to a maximum of 500 V. On the other hand, for reasons of robustness, we have given our LS low-voltage surge diverters a nominal discharge current of 5,000 A which is well in excess of that allowed for in I.E.C. standards (1,500 A).

	8134 and 8137
Surge diverter voltage rating (rescal voltage)	0.5 kV
Nominal discharge current	5 kA
Maximum front-of-wave impulse sparkover voltage	3 kV
Maximum residual voltage for nominal discharge current	2.5 kV



For rated voltages over 500 V, please consult us.

SURGE DIVERTERS 8137

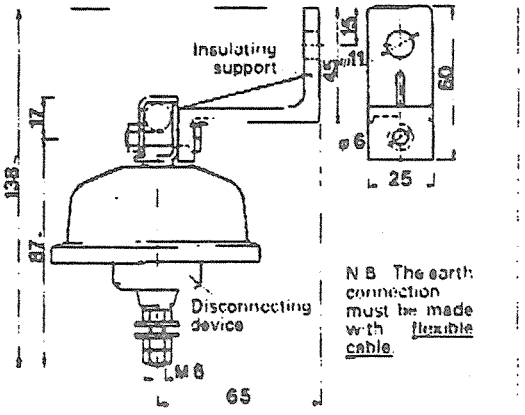
Model 8137 is identical to the 8134 except for a disconnecting device at the bottom. The purpose of the disconnecting device is to isolate the surge diverter from the earth connection in the event of a short circuit ; this may be caused by an abnormal overload, and is consequently quite rare.

DESCRIPTION - OPERATION

A pin connected to the earth connection is soldered to the centre of the diverter's metal flange. The pin is spring loaded, and the whole arrangement is enclosed in an insulating housing.

When the surge diverter is short-circuited, the continuous current causes progressive heating of the resistor on the metal flange. The temperature rise is transmitted to the solder which melts, releasing the spring-loaded pin connected to the earth-connection. The disconnecting device is thus ejected together with the earth-connection, which must absolutely be a flexible cable.

There is no outward evidence of operation apart from the fall of the earth connection, the advantage of which is that the surge diverter can easily be identified after it has been automatically disconnected by an overload

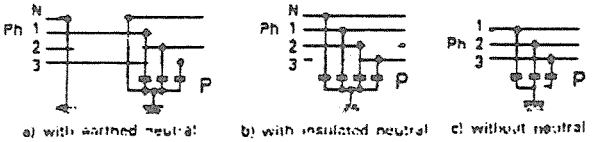


INSTALLATION CONDITIONS

The overall protection of a low-voltage system must include:
— Surge diverters at each low voltage feeder, at the transformer station or near by;
— A few surge diverters at intervals along the lines;
— Surge diverters on each service line or group of service lines in the lightning zone.

Installation is as in the following diagrams, depending on whether the neutral is earthed or insulated. In systems with an earthed neutral, the same earth connection should be used for the neutral and the surge diverters.

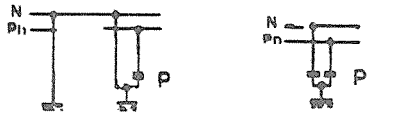
THREE-PHASE SYSTEM



a) with earthed neutral b) with insulated neutral c) without neutral

Remember that the system protection is only fully effective if the surge diverter earth connections have a low resistance

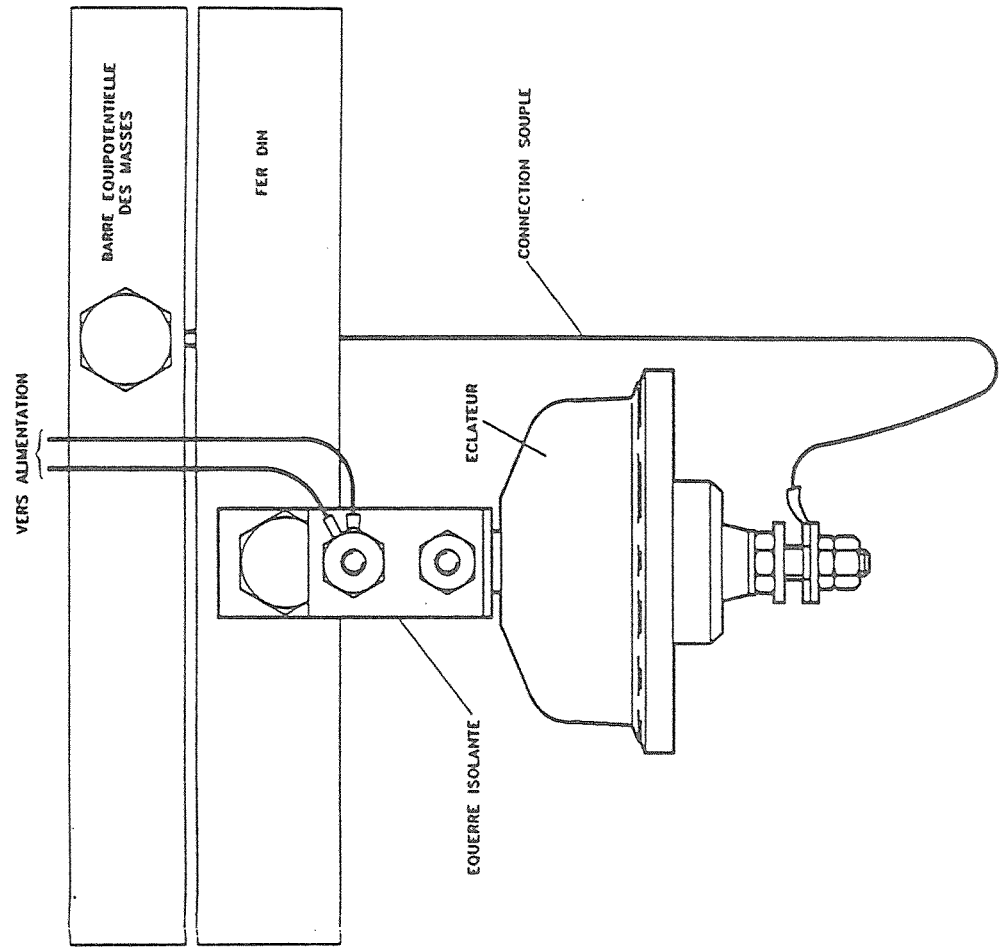
SINGLE PHASE SERVICE LINE

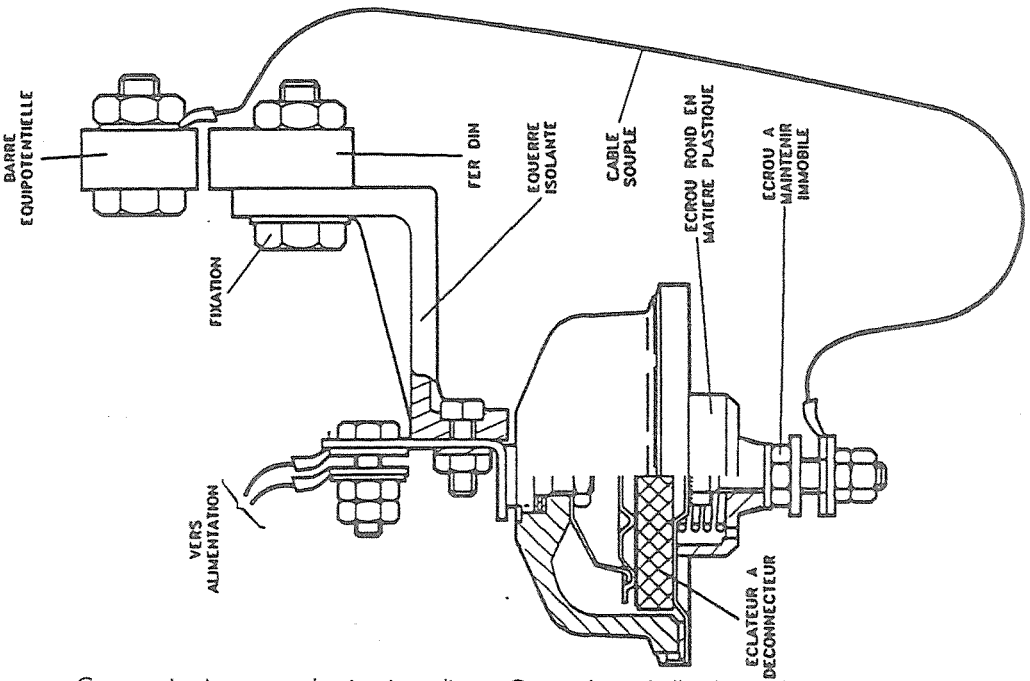


a) with earthed neutral b) without neutral or with insulated neutral or between phases

IMPORTANT NOTE: Depending on the installation and service conditions, surge diverters 8134 and 8137 may be mounted outdoors as well as indoors; in addition, the accessories supplied with the devices allow them to be suspended or mounted on a bracket.

WE ARE PLEASED TO EXAMINE SPECIAL APPLICATIONS ON REQUEST





CS TRANSPORT

APPENDIX 27

CS TRANSPORT

TRANSMITTER AJUSTMENT TABLE
"KEM"

KEM	TRANSMITTER CONNECTION		
	cable		liaisons
3	V4	V7	V5 to V6
3.25	V1	V7	V2 to V4 V5 to V6
3.50	V2	V7	V3 to V4 V5 to V6
3.75	V1	V7	V3 to V4 V5 to V6
4	V7	V8	**********
4.25	V1	V8	V2 to V7
4.50	V2	V8	V3 to V7
4.75	V1	V8	V3 to V7
5	V4	V8	V5 to V7
5.25	V1	V8	V2 to V4 V5 to V7
5.50	V2	V8	V3 to V4 V5 to V7
5.75	V1	V8	V3 to V4 V5 to V7
6	V6	V8	**********
6.25	V1	V8	V2 to V6
6.50	V2	V8	V3 to V6
6.75	V1	V8	V3 to V6
7	V4	V8	V5 to V6
7.25	V1	V8	V2 to V4 V5 to V6
7.50	V2	V8	V3 to V4 V5 to V6
7.75	V1	V8	V3 to V4 V5 to V6

CS TRANSPORT

RECEIVER ADJUSTMENT TABLE

" KRV "

KRV	R1 to	R2 to	connections	KRV	R1 to	R2 to	connections
1	R3	R4	**********	26	R9	R5	R4-R6 & R7-R8
2	R5	R4	**********	27	R9	R4	R3-R6 & R7-R8
3	R3	R5	**********	28	R9	R6	R7-R8
4	R5	R7	R3-R6	29	R9	R3	R4-R6 & R7-R8
5	R5	R7	R4-R6	30	R9	R4	R5-R6 & R7-R8
6	R4	R7	R3-R6	31	R9	R3	R5-R6 & R7-R8
7	R6	R7	**********	32	R10	R7	R5-R6 & R3-R9
8	R3	R7	R4-R6	33	R10	R7	R5-R6 & R4-R9
9	R4	R7	R5-R6	34	R10	R7	R4-R6 & R3-R9
10	R3	R7	R5-R6	35	R10	R7	R6-R9
11	R9	R7	R3-R8 & R5-R6	36	R10	R7	R3-R6 & R4-R9
12	R9	R7	R4-R8 & R5-R6	37	R10	R7	R4-R6 & R5-R9
13	R9	R7	R3-R8 & R4-R6	38	R10	R7	R3-R6 & R5-R9
14	R9	R7	R6-R8	39	R10	R5	R3-R9
15	R9	R3	R4-R7 & R6-R8	40	R10	R5	R4R9
16	R9	R4	R5-R7 & R6-R8	41	R10	R4	R3-R9
17	R9	R3	R5-R7 & R6-R8	42	R10	R9	**********
18	R9	R5	R3-R8	43	R10	R3	R4-R9
19	R9	R5	R4-R8	44	R10	R4	R5-R9
20	R9	R4	R3-R8	45	R10	R3	R5-R9
21	R9	R8	**********	46	R10	R5	R3-R6 & R7-R9
22	R9	R3	R4-R8	47	R10	R5	R4-R6 & R7-R9
23	R9	R4	R5-R8	48	R10	R4	R3-R6 & R7-R9
24	R9	R3	R5-R8	49	R10	R6	R7-R9
25	R9	R5	R3-R6 & R7-R8	50	R10	R3	R4-R6 & R7-R9

CS TRANSPORT

RECEIVER AJUSTMENT TABLE

"KRV "

KRV	R1 to	R2 to	connections
51	R10	R4	R5-R6 & R7-R9
52	R10	R3	R5-R6 & R7-R9
53	R10	R7	R5-R6 & R3-R8
54	R10	R7	R5-R6 & R4-R8
55	R10	R7	R4-R6 & R3-R8
56	R10	R7	R6-R8
57	R10	R7	R3-R6 & R4-R8
58	R10	R7	R4-R6 & R5-R8
59	R10	R7	R3-R6 & R5-R8
60	R10	R5	R3-R8
61	R10	R5	R4-R8
62	R10	R4	R3-R8
63	R10	R8	**********
64	R10	R3	R4-R8
65	R10	R4	R5-R8
66	R10	R3	R5-R8
67	R10	R5	R3-R6 & R7-R8
68	R10	R5	R4-R6 & R7-R8
69	R10	R4	R3-R6 & R7-R8
70	R10	R6	R7-R8
71	R10	R3	R4-R6 & R7-R8
72	R10	R4	R5-R6 & R7-R8
73	R10	R3	R5-R6 & R7-R8

APPENDIX 28

CS TRANSPORT

DATA SHEET
Part one

TRACK CIRCUIT N°:
FREQUENCY : Hz

RAILWAY :
STATION :
TRACK :

TRACK CIRCUIT LENGTH : m

IT
branch 1 : m
branch 2 : m

TRANSMISSION

- Configuration ESJ | IRJ | IT
- Pk of transmission point : Km
- cable length : m

RECEPTION 1

- Configuration ESJ | IRJ
- Pk of reception point : Km
- Cable length : m

Compensation Branch 1
length half-step : m
capacitors number:
capacitors value : µF

RECEPTION 2

- Configuration ESJ | IRJ
- Pk of reception point : Km
- Cable length : m

Compensation Branch 2
length half-step : m
capacitors number:
capacitors value : µF

DATA COLLECTOR

- Pk of reception point : Km
- Cable length : m

CS TRANSPORT

DATA SHEET
Part Two

TRACK CIRCUIT N°: ____

FREQUENCY : ____ Hz

TRANSMISSION SERIAL NUMBERS				
Transmitter	Matching Unit	Tuning Unit "pole"	Tuning Unit "zero"	ACI
Type : ____	Type : ____	Type : ____	Type : ____	Type : ____
série : ____	série : ____	série : ____	série : ____	série : ____
n° : ____	n° : ____	n° : ____	n° : ____	n° : ____

RECEPTION 1 SERIAL NUMBERS				
Receiver	Matching Unit	Tuning Unit "pole"	Tuning Unit "zero"	ACI
Type : ____	Type : ____	Type : ____	Type : ____	Type : ____
série : ____	série : ____	série : ____	série : ____	série : ____
n° : ____	n° : ____	n° : ____	n° : ____	n° : ____

RECEPTION 2 SERIAL NUMBERS				
Receiver	Matching Unit	Tuning Unit "pole"	Tuning Unit "zero"	ACI
Type : ____	Type : ____	Type : ____	Type : ____	Type : ____
série : ____	série : ____	série : ____	série : ____	série : ____
n° : ____	n° : ____	n° : ____	n° : ____	n° : ____

INFORMATION POINT IP	
Receiver	Matching Unit
Type : ____	Type : ____
série : ____	série : ____
n° : ____	n° : ____

PIN POINT DETECTOR PPD		
Receiver	PPD unit	Matching Unit
Type : ____	Type : ____	Type : ____
série : ____	série : ____	série : ____
n° : ____	n° : ____	n° : ____

DATA SHEET
Part three

TRACK CIRCUIT N : ____
FREQUENCY : ____ Hz

TRANSMITTER ADJUSTMENT			
KEM : ____	KMU : ____	POWER Low / High	SELF-MODULATION
Connections Cable → _ → _ _ → _ _ → _ _ → _	Connections Cable → _ → _ _ → _ _ → _ _ → _	Connections in high power M2 → M4 M2 → M5 nota : without connection in low power	Connections M1 → M3

RECEPTION 1 ADJUST.		RECEPTION 2 ADJUST.		DATA COLLECTOR ADJUST.	
KRV : ____	KMU : ____	KRV : ____	KMU : ____	KRV : ____	KMU : ____
Connections R1 → R_ R2 → R_ R_ → R_ R_ → R_ R_ → R_ C → C2	Connections Cable → _ → _ _ → _ _ → _ _ → _	Connections R1 → R_ R2 → R_ R_ → R_ R_ → R_ R_ → R_ C → C2	Connections Cable → _ → _ _ → _ _ → _ _ → _	Connections R1 → R_ R2 → R_ R_ → R_ R_ → R_ R_ → R_ C → C2	Connections Cable → _ → _ _ → _ _ → _ _ → _

CS TRANSPORT

DATA SHEET
Part four

TRACK CIRCUIT N :

FREQUENCY : Hz

Length (m)	TRANSMITTER				TRACK TRANS.		TRACK RECEPT		RECEIVER 1					
	KEM	Vtx (V)		Itx (A)	VT (V)		VR (V)		V V1V2 (V)		KRV		V R1R2	
		min.	max.	moy.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.

RECEIVER 2					
V V1V2 (V)		KRV		V R1R2	
min.	max.	min.	max.	min.	max.

A067

T[illegible] CIRCUIT N : . . . .

FREQUENCY : . . . . Hz

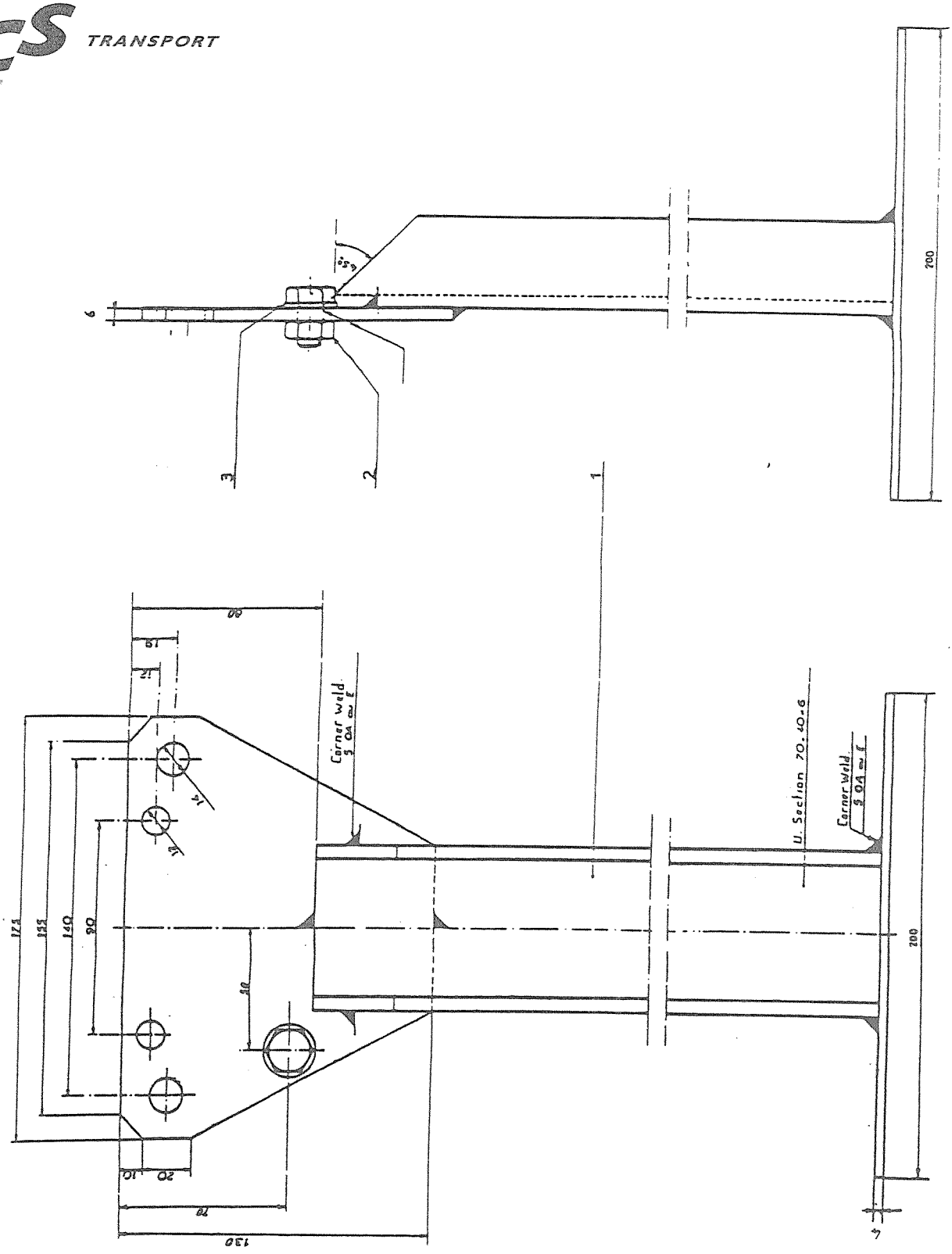
DATA SHEET
Part five

DATE	CLIMATIC CONDITIONS	TRANSMITTER			TRACK TRANS	TRACK RECEP.	RECEIVER			RECEPTION CONFIGURATION
		Val (V)	Vtx (V)	Itx (A)	VT (V)	VR (V)	Val (V)	V V1V2	V R1 R2	
										reception 1
										reception 2
										recep. data collector
										reception 1
										reception 2
										recep. data collector
										reception 1
										reception 2
										recep. data collector
										reception 1
										reception 2
										recep. data collector
										reception 1
										reception 2
										recep. data collector
										reception 1
										reception 2
										recep. data collector
										reception 1
										reception 2
										recep. data collector

A068

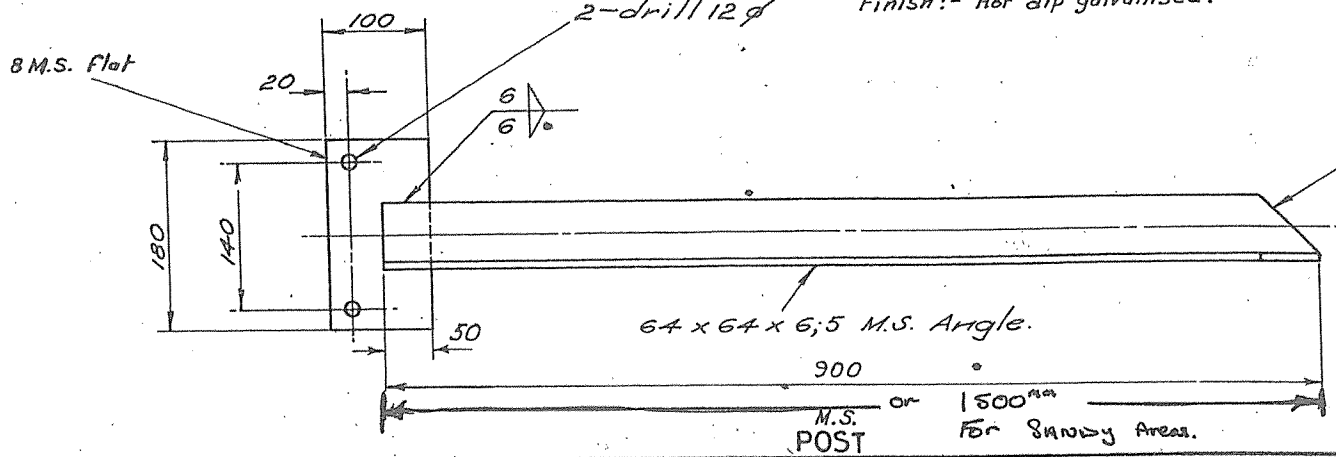
APPENDIX 29

CS TRANSPORT



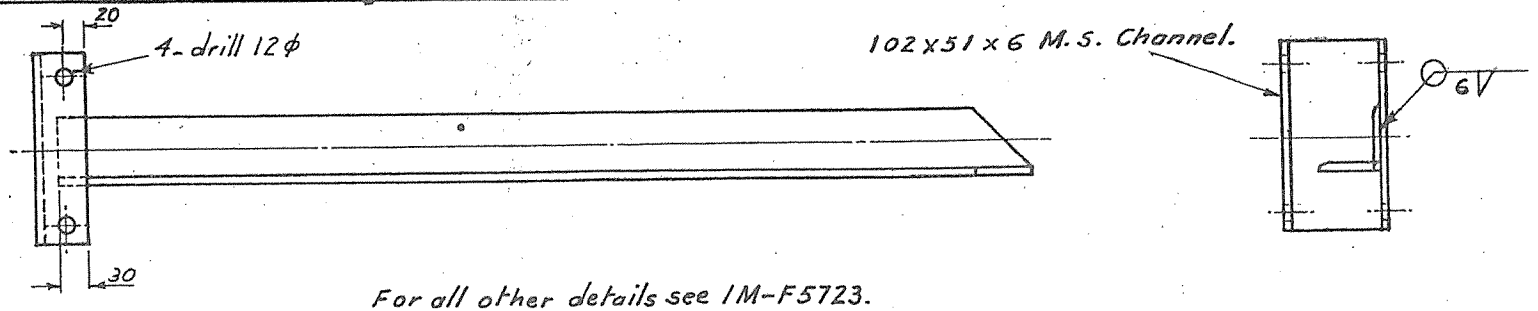
MOUNTING STAKE

Finish:- Hot dip galvanised.



M.S. POST

1M-F5723



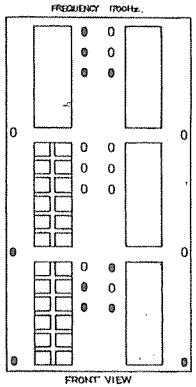
For all other details see 1M-F5723.

M.S. POST

2M-F5723

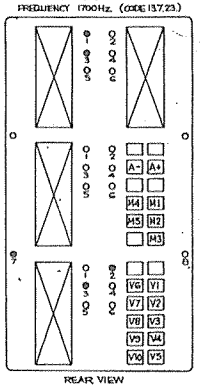
A	7-9-84	This drawing is to the metric standard (T.S.O.). Dimens. are in millimeters. Tolerances unless otherwise stated ±0,5	V.R.	C.S.E.E. TRACK CIRCUIT TRACKSIDE BOXES SUPPORT POST 22-11-74	S.&C. Engineer.	Designed M.J.R.	Drawn M.J.R.	M-F 5723	
Part N°2M-F5723 added						S.D.E.	M.E. S.B	Ckd.	Iss.No
		3RD. ANGLE PROJECTION							

MOUNTING CHANNEL
FREQUENCY 1700Hz.



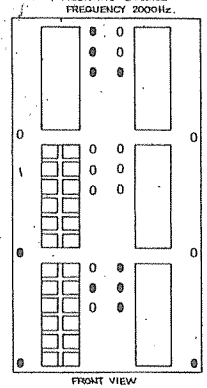
FRONT VIEW

TRANSMITTER EM-UM71
FREQUENCY 1700Hz. (CODE 13.7.23.)



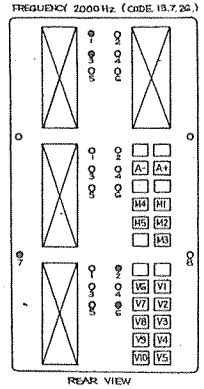
REAR VIEW

MOUNTING CHANNEL
FREQUENCY 2000Hz.



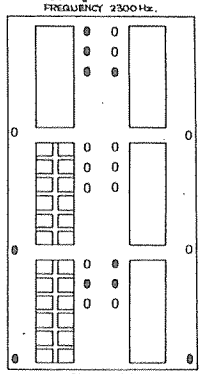
FRONT VIEW

TRANSMITTER EM-UM71
FREQUENCY 2000Hz. (CODE 13.7.26.)



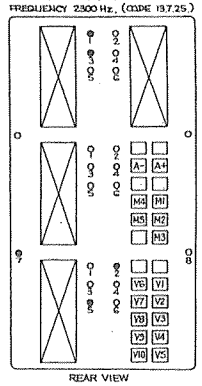
REAR VIEW

MOUNTING CHANNEL
FREQUENCY 2300Hz.



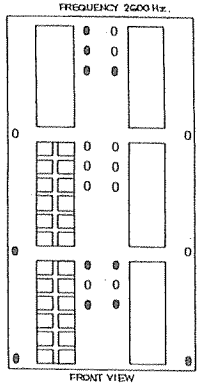
FRONT VIEW

TRANSMITTER EM-UM71
FREQUENCY 2300Hz. (CODE 13.7.25.)



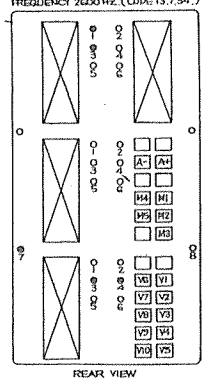
REAR VIEW

MOUNTING CHANNEL
FREQUENCY 2600Hz.



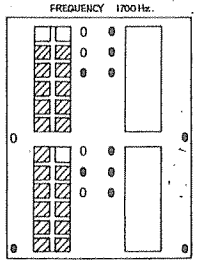
FRONT VIEW

TRANSMITTER EM-UM71
FREQUENCY 2600Hz. (CODE 13.7.34.)



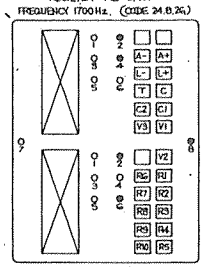
REAR VIEW

MOUNTING CHANNEL
FREQUENCY 1700Hz.



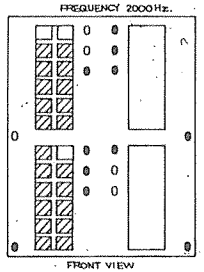
FRONT VIEW

RECIEVER RE-UM71
FREQUENCY 1700Hz. (CODE 24.8.26.)



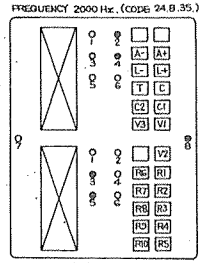
REAR VIEW

MOUNTING CHANNEL
FREQUENCY 2000Hz.



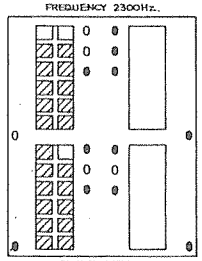
FRONT VIEW

RECIEVER RE-UM71
FREQUENCY 2000Hz. (CODE 24.8.35.)



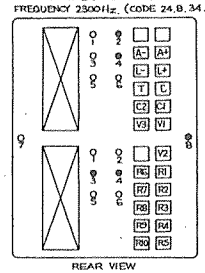
REAR VIEW

MOUNTING CHANNEL
FREQUENCY 2300Hz.



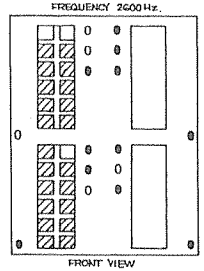
FRONT VIEW

RECIEVER RE-UM71
FREQUENCY 2300Hz. (CODE 24.8.34.)



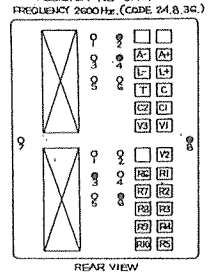
REAR VIEW

MOUNTING CHANNEL
FREQUENCY 2600Hz.



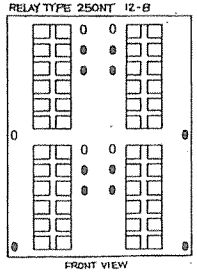
FRONT VIEW

RECIEVER RE-UM71
FREQUENCY 2600Hz. (CODE 24.8.32.)



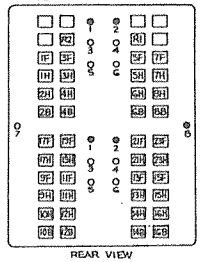
REAR VIEW

MOUNTING CHANNEL
RELAY TYPE 250NT 12-8



FRONT VIEW

RELAY. TYPE 250NT 12-8 (CODE 12-8-12)



REAR VIEW

NOTES:

1. CONTACT POSITIONS AS SHOWN ARE NOT SHOWN ON EQUIPMENT.
2. ⓪ SYMBOL INDICATES RUBBER PLUG FITTED.
3. ● SYMBOL INDICATES CODE PIN FITTED.

VICTORIAN RAILWAYS	S&C Engineer	Designed	Drawn LJT.	
C.S.E.E. TRACK UNITS		SDE.	C.M.	Chd.	Sc. No. 13.
CONNECTION & CODING DETAILS. 2-9-76.	B 5521				

SIGNALLING CATALOGUE
COMPONENTS & STANDARD PRACTICES

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